

UGANDA PROTECTORATE.

ANNUAL REPORT

OF THE

DEPARTMENT OF AGRICULTURE

FOR THE

YEAR ENDED 31ST DECEMBER, 1928.

Published by Command of His Excellency the Governor.

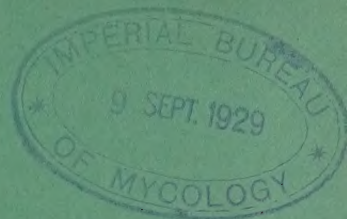


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STAFF LIST.

<i>Director of Agriculture</i>	...	...	S. SIMPSON, C.M.G., B.SC. (EDIN.), M.R.A.S.E., N.D.A.
<i>Deputy Director of Agriculture</i>	...	...	L. HEWETT, M.R.A.C.
<i>Statistician and Secretary Cotton Board</i>	...	...	A. S. WIDGERY.
<i>Office Superintendent</i>	...	...	G. A. READ.
<i>Clerk</i>	...	...	W. H. B. ETHERIDGE.

GENERAL DIVISION.

Senior Agricultural Officers :

A. R. MORGAN. R. G. HARPER (Retired 23rd September).
G. F. CLAY, M.C., B.SC. (EDIN.), N.D.A., N.D.D. (HONS.).

Superintendent of Agricultural Education :

E. G. STAPLES, M.A., M.R.A.C., DIP. AGRIC. (CANTAB.).

Agricultural Officers :

J. D. SNOWDEN.	R. T. WICKHAM.	C. E. J. BIGGS, B.SC. (LOND.), DIP. AGRIC. (WYE).
D. STEDMAN-DAVIES, B.SC. (WALES).		A. B. KILLICK, B.SC. (LOND.), DIP. AGRIC. (WYE).
N. S. HAIG, B.SC. (LOND.), DIP. AGRIC. (WYE).		E. F. MARTIN, DIP. AGRIC. (HARPER ADAMS AND NORTHANTS).

<i>Coffee Officer</i> ...	W. L. MUNN.
<i>Cotton Grader and Ginning Inspector</i> ...	MAJOR N. G. WRIGHT.

Plantation Managers :

G. T. PHILPOTT.	F. W. HALL.	CAPT. J. S. HARMSWORTH, M.C.
C. HAZEL.	P. CHANDLER.	E. A. RUCK.

Ploughing Instructors :

A. L. STEPHENS. G. H. THOMAS.

AGRICULTURAL LABORATORIES.

<i>Entomologist</i> ...	H. HARGREAVES, A.R.C.S., D.I.C., F.E.S.
<i>Assistant Entomologist</i> ...	G. L. R. HANCOCK, M.A. (CANTAB.), F.E.S.
<i>Mycologist</i> ...	C. G. HANSFORD, M.A. (CANTAB.).
<i>Botanist</i> ...	L. C. C. LIEBENBERG, B.SC. (TRANS.), M.SC. (MCGILL).
<i>Cotton Botanist</i> ...	G. W. NYE, B.SC. (LOND.), DIP. AGRIC. (WYE).
<i>Assistant Cotton Botanist</i> ...	H. R. HOSKING, B.SC. (LOND.), A.R.C.S.
<i>Agricultural Chemist</i> ...	W. S. MARTIN, PH.D., M.SC. (LOND.), A.R.C.S., D.I.C., A.I.C.

CLERICAL STAFF.

J. C. DE SOUZA. A. S. REMEDIOS. M. A. S. MENEZES. F. C. DE SOUZA.

NATIVE CIVIL SERVICE.

KOSEA MUKASA (*Overseer*). REUBEN SEMPAGALA (*Clerk*). YOWANA KAIKZI (*Laboratory Assistant*).

DEPARTMENT OF AGRICULTURE.

ANNUAL REPORT, 1928.

Addresses of Officers and Telephone Numbers:

						<i>P.O. Box</i> No.	<i>Telephone</i> No.
DIRECTOR OF AGRICULTURE	...	...	...	Kampala	...	281	189
HEAD OFFICE	...	...	...	Kampala	...	281	15
AGRICULTURAL LABORATORY AND KAMPALA PLANTATION				Kampala	...	5	18
BOTANICAL GARDENS AND METEOROLOGICAL OFFICE	...			Entebbe	...	60	38
JINJA OFFICE	...	...	...	Jinja	...	67	22

PRINCIPAL EXPERIMENTAL STATIONS:

- (1) Kampala. (2) Serere, Teso. (3) Bukalasa, Mengo,
and The Botanic Gardens, Entebbe.

SUBSIDIARY STATIONS:

- (1) Ngetta, Lango. (3) Buwunga, Masaka.
(2) Fort Portal, Toro. (4) Kakumiro, Mubende.
(5) Bugusege, Bugishu.

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DEPARTMENT OF AGRICULTURE.

ANNUAL REPORT

FOR THE YEAR ENDED 31ST DECEMBER, 1928.

Staff.

The following appointments and movements took place during the year :—

MR. S. SIMPSON, C.M.G., Director of Agriculture, went on leave on December 9th.

MR. L. HEWETT, Deputy Director of Agriculture, went on leave on March 17th and returned on October 9th.

MR. A. R. MORGAN, Senior Agricultural Officer, returned from leave on February 17th and was acting Director of Agriculture from December 4th.

MR. R. G. HARPER, Senior Agricultural Officer, retired on pension on September 23rd.

MR. G. F. CLAY, M.C., Senior Agricultural Officer, assumed duty on November 28th, on transfer from Amani Research Institute.

MR. J. D. SNOWDEN, Agricultural Officer, went on leave on May 12th and returned on December 23rd.

MR. C. E. J. BIGGS, Agricultural Officer, was acting Senior Agricultural Officer from July 1st to the end of the year.

MR. E. G. STAPLES, Superintendent of Agricultural Education, went on leave on July 7th.

MR. A. B. KILLICK, Agricultural Officer, returned from leave on February 17th and was acting Superintendent of Agricultural Education from July 5th.

MR. R. T. WICKHAM, Agricultural Officer, went on leave on October 12th.

MR. H. HARGREAVES, Entomologist, went on leave on April 14th and returned on November 24th.

MR. G. L. R. HANCOCK, Assistant Entomologist, returned from leave on June 19th and was acting Entomologist from June 23rd to November 27th.

MR. H. R. HOSKING, Assistant Cotton Botanist, arrived on September 11th on first appointment.

CAPT. J. S. HARMSWORTH, M.C., Plantation Manager, went on leave on April 27th and returned on December 13th.

MR. F. W. HALL, Plantation Manager, returned from leave on June 9th.

MR. C. HAZEL, Plantation Manager, returned from leave on March 2nd.

MR. A. S. WIDGERY, Statistician and Secretary Cotton Board, was seconded for duty in the Secretariat from December 1st.

MR. G. A. READ, Office Superintendent, went on leave on March 5th and returned on October 26th.

MR. E. M. BAIRD, Ploughing Instructor, resigned on March 1st.

MR. W. H. B. ETHERIDGE, Clerk, went on leave on December 9th.

2. The Director of Agriculture, Mr. S. Simpson, went on leave in December prior to retirement. Mr. Simpson came to Uganda as Director in 1912 and his work has been closely connected with the general economic development of this country for nearly seventeen years. The cotton industry was then in its early stages with an output of about 20,000 bales: the value of cotton lint exported for the year 1911-12 was £230,850. Thus during the seventeen years of Mr. Simpson's service the cotton industry has grown to its present dimensions, an output approaching 200,000 bales (1928-29) representing an export valuation of approximately £4,000,000. In 1912 the total value of domestic produce exported amounted to £341,870 whilst for the year 1928 the total was £3,395,267. These figures will convey an idea of the economic progress made in Uganda during the period of Mr. Simpson's service and his retirement is a great loss to the Protectorate. His work received public recognition by his appointment to be a Companion of the Most Distinguished Order of St. Michael and St. George in 1926.

3. Prior to his departure, Mr. Simpson recorded the following appreciation of the services of Mr. R. G. Harper, Senior Agricultural Officer, who retired on September 23rd:—

"The retirement of Mr. Harper is a serious loss to this Department and to the cotton industry in this country. During the whole of his seventeen years service Mr. Harper has been stationed in the Teso District of the Eastern Province and the work of cotton seed selection has been carried out by him from the beginning of his service. The maintenance in the quality of Uganda cotton is in no small measure due to the careful and thorough manner in which he has carried out his duties."

4. I desire to record my appreciation of the services rendered by all members of the staff during the year.

General.

5. The weather conditions during 1928 were generally favourable to the growth of all crops, although there were marked variations according to districts.

In the Lango district of the Eastern Province the rainfall for the year was the highest yet recorded and the months of May, June and August were abnormally wet.

6. The famine conditions referred to in my report for 1927 materialised, but owing to the prompt measures taken by the Government to deal with the situation there was little or no distress and with the harvesting of the spring crops in the middle of the year local food supplies again became normal.

Exports.

7. The total value of domestic produce exported from the Protectorate during the year amounted to £3,395,267 compared with £2,310,260 for the preceding twelve months. The value of ginned cotton exported amounted to £2,475,327, representing 138,486 bales and 72·9% of the total exports, compared with £1,690,838 in 1927. A table showing the details of exports for the year is given below, and comparative tables will be found in Appendices 9 and 10.

Description.		Quantity.		Value £		Per cent.
Cotton, raw	...	553,944	centals	2,475,327	...	73·0
Cotton seed	...	45,506	tons	323,110	...	9·5
Hides (dry and dry salted)	...	58,677	cwts.	257,288	...	7·6
Coffee, raw	...	40,355	cwts.	164,187	...	4·8
Rubber, plantation	...	11,312	centals	54,978	...	1·6
Metalliferous Ores, non-ferrous	...	252	tons	50,673	...	1·5
Chillies	...	4,437	cwts.	25,848	...	·8
Ivory	...	329	cwts.	21,759	...	·6
Skins, sheep and goat	...	163,042	No.	8,039	...	·2
Other exports	...	...	...	14,058	...	·4
				£3,395,267		

Cotton.

8. Cotton, as can be seen from the table above, is the principal crop of the Protectorate, and the output is the production of thousands of native peasants, growing the crop on small plots throughout the country. Although the chief producing areas are the Eastern and Buganda Provinces, cotton is cultivated in each of the eighteen districts of the Protectorate except two—Kigezi in the extreme south-west and Karamoja in the north-east.

9. The table below shows the approximate figures of acreages planted in the various districts during the year under review. Figures of the previous year are also shown for comparison :—

EASTERN PROVINCE :—			1927.	1928.
Busoga District	...	...	77,654	114,800
Budama "	...	...	21,710	21,590
Bugwere "	...	...	55,000	82,170
Bugishu "	...	...	25,500	25,070
Teso "	...	...	69,737	132,000
Lango "	...	...	53,000	71,500
TOTAL			302,601	447,130
BUGANDA PROVINCE :—				
Mengo District	...	...	108,000	102,000
Entebbe "	...	...	40,000	47,260
Masaka "	...	...	22,000	17,700
Mubende "	...	...	30,000	33,140
TOTAL			200,000	200,100
NORTHERN PROVINCE :—				
Bunyoro District	...	...	9,750	9,870
Gulu "	...	...	10,930	12,370
Chua "	...	...	7,023	11,100
West Nile "	...	...	300	8,000
TOTAL			28,003	41,340
WESTERN PROVINCE :—				
Toro District	...	...	2,400	3,000
Ankole "	...	...	—	7,230
TOTAL			2,400	10,230
GRAND TOTAL			533,004	698,800

10. 1927/28 CROP.—In the Eastern Province cotton buying opened on January 9th in four districts and on January 16th and February 1st in the remaining two, *viz.*, Lango and Busoga respectively.

11. Owing to the very hot and dry weather the season was a short one in the northern parts of the province and late pickings were small. The average yield for the province was estimated at 277 lbs. per acre which was satisfactory, considering the erratic weather conditions which prevailed during the planting and growing season in 1927, and which were alluded to in last year's report.

The output of cotton amounted to 37,493 tons, compared with 41,097 tons in the previous year.

12. In Buganda Province where the season was more favourable the crop amounted to 39,498 tons compared with 29,216 the previous year.

13. Similar arrangements were made as in the preceding year with regard to the prescribing under the Cotton Ordinance of a period of four weeks from the opening of the Cotton Buying Season during which no raw cotton other than "good" could be bought or sold in all districts in the Eastern and Buganda Provinces. This regulation again had a beneficial effect in helping to raise the average standard of the lint exported.

14. 1928/29 CROP.—Following the period of famine conditions which had prevailed in parts of the Eastern and Northern Provinces at the close of the previous year and which continued for the first few months of 1928, the climatic conditions were favourable for the planting of food crops and with these well established by May the preparation of land for cotton became general. Planting was started at the end of May and the weather conditions during the sowing season were generally satisfactory throughout the Protectorate except in Lango district in the Eastern Province where abnormally heavy rains were experienced.

15. The table in para. 9 shows the estimated acreages planted and it will be seen that the total exceeds the previous year's planting by 165,796 acres, mainly due to the large increase in the Eastern Province.

16. The second or short rains were generally normal, again excepting Lango district where the rainfall was unusually heavy and had an adverse effect on the crop. At the end of the year the prospects of a good crop being obtained were very promising, although in the northern parts of Teso district an outbreak of "blackarm" disease indicated a reduced yield in the affected area and cotton stainers were also more numerous than usual. In 1927 the absence of stainers was very marked.

17. TRANSPORT.—Extensions of the Kenya and Uganda Railway northward from Tororo towards Soroti were under construction during the year and the decision to continue the railway from Jinja across the River Nile through to Kampala was taken and work was started at the end of the year.

18. Large numbers of motor lorries and light motor vans were again on the roads in connection with the collection and transport of the cotton crop to ginneries and markets.

19. COTTON SEED.—Exports of cotton seed amounted to 45,506 tons, valued at £323,110, compared with 29,500 tons, valued at £170,303, in 1927.

20. The restrictions on the movement of cotton seed for export were again in force to enable baled cotton to receive priority, but it was possible to relax these earlier than in 1927 and exports began on March 15th.

21. COTTON TAX.—The tax on cotton lint exported based on a sliding scale under the Cotton (Tax) Ordinance 1926, was 6 cents ($\frac{3}{4}$ d.) per lb. of lint and realised £164,483 for the year. The figures for the previous year were £51,478 when the tax was 2 cents ($\frac{1}{4}$ d.) per lb.

22. COTTON GINNERIES.—No fresh sites for the erection of ginneries were granted during the year, the number of factories already built, as has been pointed out on numerous occasions, being far in excess of requirements. 164 ginneries took out licences to gin and bale cotton in 1928, of which 146 actually worked compared with 186 in 1927.

A detailed list of ginneries is given in Appendix 11.

Some notes by the Cotton Grader and Ginning Inspector will be found on page 37.

23. LOCAL COTTON TRADING.—In the local market transactions in baled cotton were again numerous and particulars of registered contracts representing 125,307 bales were recorded.

24. DESTINATION OF UGANDA COTTON.—The following table shows the principal countries to which direct shipments of the 1928 crop were made during the year and a comparison is given with the previous year:—

				1928.		1927.
				Bales.		Bales.
Great Britain	...	...	...	49,304	...	35,125
India	...	...	...	76,304	...	65,846
Japan	...	...	...	12,728	...	29,697
		TOTAL	...	138,336	...	130,668

25. BUYING ASSOCIATIONS.—A new phase in the development of the cotton industry took place in connection with the marketing of the 1927/28 crop, when the ginning firms in Buganda Province combined to form the Buganda Seed Cotton Buying Association which fixed the prices to be paid by the Association to the growers for raw cotton at all markets and ginneries throughout the Province. This combine handled the bulk of the crop and some dissatisfaction was expressed by growers at the prices and lack of competition.

Coffee.

26. The acreage under *C. arabica* grown by non-natives remains at approximately the same figure as last year, as although some new plantings have taken place in the Toro district of the Western Province, other areas where the climatic conditions are not so suitable for this variety of coffee show reductions. The acreage, computed from returns received from non-native plantations, is estimated at 12,951.

Some notes on *C. arabica* by the Coffee Officer will be found on page 20.

27. The acreage under *C. robusta* cultivated by non-natives shows an increase of 775 acres and the area under this crop is estimated as 5,457 acres. This type of coffee shows every sign of gradually replacing *C. arabica* in the lower and more humid parts of the country such as are to be found around Lake Victoria. The cultivation of *C. robusta* cannot be recommended at the higher elevations in this country but at 4,000 feet or under, as far as altitude is concerned, it thrives.

28. The native coffee industry made steady progress during the year and large numbers of plants of *C. robusta* were issued to growers from central nurseries. This variety of coffee is the one encouraged in the Buganda Province and in the low lying Bwamba County of Toro in the Western Province. The estimated acreage under *C. robusta* grown by natives is 6,500. The report of the Botanist, to be found on page 48, shows what is being done with regard to seed selection in connection with this crop.

29. The following from the Annual Report of the Acting Superintendent of Agricultural Education, Mr. A. B. Killick, deals with *C. robusta* extension work in Buganda Province:—

(a) "ROBUSTA COFFEE.—As in 1927 the sowing of seed has been confined to three centres:—

The Government Plantation, Kampala.
The Government Plantation, Bukalasa.
The Botanic Gardens, Entebbe.

Owing to the very great demand for plants it has been difficult at times to keep the out-nurseries supplied with seedlings raised from selected seed.

Several new out-nurseries were established during the year in response to requests from Saza and Gombolola Chiefs. The following number were in existence by the end of the year:—

					Nurseries.
Mengo District :—	Kyagwe	...	...	...	6
	Bulemezi	...	..	...	11
	Kyadondo	...	...	...	3
Entebbe District :—	Busiro	...	...	...	3
	Mawokota	...	...	...	8
	Butambala	...	...	...	2
	Gomba	...	...	...	3
	Busuju	...	...	...	1
	Sese Islands	...	...	...	7
Mubende District :—	Singo	...	...	...	5

Seven of these nurseries are new, and some have not yet been supplied with plants. During the year, two men trained on the Government Plantation, Kampala, were appointed to Entebbe district to take charge of the nursery beds. The beds have been maintained by the Native Government under the supervision of this department, except those in Mubende district, and on the whole they have been well cared for.

(b) DISTRIBUTION OF SEEDLINGS TO NATIVE CULTIVATORS.—The following is the approximate number of seedlings distributed during the year:—

					Plants.
Mengo District	...	...	...	...	167,839
Entebbe District	...	...	...	...	125,891
Singo, Mubende	...	...	...	...	47,163
TOTAL					340,893

At the end of the year the district nursery beds contained plants as under:—

					Plants.
Entebbe District, excluding Sese Islands	...	...	...	...	77,401
Mengo District	...	...	...	...	52,694
Singo, Mubende	...	...	...	...	33,624
TOTAL					163,719

These nursery beds are not so well stocked with plants as could be desired. Stocks of seed, however, were not obtained until late in the year, in consequence the seedlings are still in the beds at headquarters, which are very well stocked with plants. These will be distributed to out-nurseries early in 1929.

Selected seed has been obtained in bulk from the Coffee Officer and from single plant selections made by the Botanist.

Sixty-six pounds of seed have been supplied to other districts."

30. *C. arabica* is also grown by natives in various parts of the Protectorate but is actively encouraged only in the Bugishu district in the Eastern Province where a small but flourishing industry has been established for several years, and recently in the Ankole and Kigezi districts of the Western Province.

31. The following extracts from the Annual Report by Mr. N. S. Haig, Agricultural Officer, shows the progress being made in the Bugishu district:—

(a) "Planting of this year's coffee plots commenced in April, and continued until September under good conditions of rainfall. The percentage of deaths of young trees at planting time was satisfactorily low.

The numbers of trees planted out into permanent plots is given below:—

(a)	From Departmental nursery beds	...	...	150,205
(b)	From privately owned beds	...	...	25,134
TOTAL		...	...	175,339

The above represents an acreage of approximately 250 acres (at 700 trees per acre), planted during 1928, and brings the present total acreage of Bugishu coffee to 1,134 acres.

(b) Trees planted previously to 1928, at the lower altitudes, suffered a considerable setback from the drought at the commencement of the year, which resulted in the dying back of primaries and shedding of leaves; good growth was made later, however, and the crop of cherry does not appear to have been much influenced. At the higher altitudes lack of rain was not so marked. Harvesting of the crop commenced in September, and was still in progress at the end of the year at the higher altitudes.

During the year, six new pulping machines were erected in time to deal with the crop.

There were thus 19 machines in the district to deal with the crop, and considerably less cherry was pulped by hand.

(c) A very considerable proportion of the parchment coffee was insufficiently dried before marketing this year, although fermentation and washing of the pulped coffee was done satisfactorily. Unfortunately, this was due, in large measure, to the ease with which the growers found they could dispose of this indifferently prepared parchment at high prices. Competition for the purchase of the crop was very keen this year, and little or no differentiation in grade was made by the bulk of the buyers. Prices have averaged from 45 to 50 cents per lb. of parchment coffee, which is the highest level to which they have yet risen in Bugishu.

(d) Trial markets were held at Bubulu and Budadiri during November in collaboration with the District Commissioner, and stalls were rented by four or five firms interested in the crop. The quantity brought in for sale, however, amounted to approximately two tons only, as the bulk of the crop had already been bought up outside. These trial markets gave several useful hints for the establishment of the larger markets which it is hoped will be arranged for next season's crop.

(e) Accurate figures for the purchases of the 1928 crop are not yet available, but are expected to amount to from 145 to 150 tons. Comparative figures of purchases and prices of the crop for the last three years are given below:—

		1926—Tons	1927—Tons	1928—Tons.
Total purchases	...	85	110	145
		Cents.	Cents.	Cents.
Average price per lb.	...	42	33 to 38	50

(f) The cultivation of coffee in Bugishu continues to be very popular, and all available plants at the nurseries are quickly disposed of. Several gombololas which up to the present have cultivated cotton in the plains at long distances from their homes are now anxious to cultivate coffee instead; the natives in such gombololas are being encouraged to do so, as they can give far more attention to their coffee plots which are at hand, whereas there has always been trouble in inducing such natives to spend sufficient time on their cotton plots.

(g) Bugishu has been toured twice by the Coffee Officer during the year, and all Coffee Instructors were given a course in pruning on the single stem system, which it has now been decided to adopt in Bugishu.

(h) No signs have been noticed of the spread of the *Coffee Berry Borer* this year but the *Coffee Bug* has been noticed in considerable quantities, and its range appears to be spreading. This pest has been responsible for a large proportion of 'lights.'

The *Coffee Stem Borer* exists on some old plots, but shows no tendency to increase, and Instructors know how to deal with it."

32. The exports of coffee from the Protectorate during the year amounted to 40,355 cwts., valued at £164,187, compared with 43,514 cwts., valued at £170,407, in 1927.

Rubber.

33. Para rubber (*Hevea braziliensis*) is grown by non-natives to the extent of 12,939 acres. The decline in value on the home market was responsible for the reduction in the amount and value of the rubber exported, as will be seen from the table given below:—

				Exported, lbs.		Value £
1926	...	...	...	1,356,100	...	135,619
1927	...	...	...	1,446,300	...	82,077
1928	...	...	...	1,131,200	...	54,578

34. As a result of the visit to Ceylon of an officer (Mr. F. W. Hall) of this department, mentioned in last year's report, some trial budding was undertaken on the Kampala plantation and other experiments in connection with the selection of high yielders are being continued.

Sugar.

35. The sugar factory established in 1925 by Indian enterprise at Lugazi between Kampala and Jinja was enlarged during the year to a capacity of 5,000 tons per annum. The local market absorbs the output, but during the year 2,749 cwts., valued at £4,434, were exported to other territories.

36. The extension of the Kenya and Uganda Railway from Jinja to Kampala now under construction will pass through or near this sugar-producing centre and on completion will provide direct means of transport for Uganda sugar over the whole of the railway system. The climatic and soil conditions have shown themselves admirably suited to successful sugar cane cultivation in this part of the Protectorate and further extensions in this direction may be expected.

37. Power alcohol and methylated spirits are also produced at Lugazi and the acreage under cane in connection with this factory amounts to 6,312 acres.

38. Circular No. 19 dealing with Sugar Cane in Uganda by the Mycologist was issued during the year.

Tobacco.

39. The experimental work in connection with the establishment of a tobacco industry was continued in Bunyoro district of the Northern Province and good progress was made. Several European planters with coffee estates have experimented with this crop both in Bunyoro and in Buganda and some excellent crops were grown. Natives in Bunyoro showed great interest in tobacco and under the supervision of this department and a representative of the British American Tobacco Company raised a crop of approximately 50,000 lbs. of fire-cured leaf which was purchased by the British American Tobacco Company for use in their cigarette factory established during the year at Jinja.

40. Mr. Philpott, who visited Nyasaland in 1926 to study this crop, was in charge of all tobacco work during the year and his report will be found on page 17.

41. Mr. Hazel, Plantation Manager, was also posted to Bunyoro in March to assist.

Tobacco figured in the exports for the first time as 8,539 lbs. valued at £327. In connection with the cultivation of this crop by natives it must be emphasized that it is considerably more difficult to grow and handle than cotton and that the curing of tobacco means something far more than merely drying the leaves. Only properly cured leaf is saleable and at the present time the local market is not unlimited. Steady progress in one area under as close supervision as possible is the present policy and no encouragement can yet be given by the Department to extensions of tobacco growing by natives in other areas, where the essential supervision could not be given.

Miscellaneous Crops.

42. TEA.—This crop has been grown for many years in small plots by the department and quantities of seed have been issued to those interested in growing tea. Assam Indigenous and Manipuri (Kalline) are grown on the Government plantations—the latter introduced in 1925. From returns received from planters an increase of acreage is recorded and some 300 acres are now grown. There is a ready sale for the locally manufactured product in both Uganda and Kenya.

43. **CHILLIES.**—Owing to the sudden rise in price at the end of 1927 renewed interest was shown in the crop during a part of the year and exports increased from 1,308 cwts., valued at £4,359, to 4,437 cwts., valued at £25,848.

44. **SIMSIM AND GROUNDNUTS.**—Both these crops are widely grown by natives, but the amounts available for export are mainly governed by the price of cotton. Local consumption of these products was greater than usual on account of the famine conditions which prevailed for a part of the year in the Eastern and Northern Provinces.

45. **MAIZE.**—This crop is growing in importance and with the extension of the railway system the cultivation for export is assuming a more important position in the economic development of the country. Improved varieties of maize were again distributed over wider areas. During the year the question of the export freight rate on maize from Uganda was taken up and subsequently the railway rates on maize flour were reduced. This product thus became a marketable commodity over a large area of the Protectorate and also the possibilities of making and selling the maize flour locally were considerably advanced.

Food Crops.

46. **IN THE EASTERN PROVINCE**, owing to the failure of the 1927 crops, a large proportion of the population of Lango, Teso and Bugwere districts had to be fed during the early months of the year on imported maize meal, whilst other areas made heavy demands on their local granaries of famine reserve grain. Several members of the staff of the department were engaged for varying periods on famine relief work. By May, however, the position was normal again, the 1928 plantings were established and the subsequent harvests were satisfactory generally.

47. **IN BUGANDA PROVINCE** the food crop position was never more than slightly unfavourable and except during the first few months of the year no real shortage occurred and food was plentiful for the remainder of the year.

Ploughing.

48. The chief areas, where the use of ploughs has become established, are to be found in the Teso and Bugwere districts in the Eastern Province, and both areas are well supplied with stock. In the former district the Senior Agricultural Officer reported that over 3,400 ploughs were now in use, an increase of over 450 compared with 1927. This total represents roughly one plough for every 19 tax payers, whilst only five years ago the ratio was approximately one to 220. Ploughing instruction proceeded under native instructors employed by the department under supervision of a European Ploughing Instructor and the Native Administration also employed native instructors.

49. Of the Bugwere district the Agricultural Officer, Mr. Haig, writes:—

“Ploughing continues to be very popular in Bukedea County and there are now 1,259 ploughs in this area—261 having been purchased during 1928. It is interesting to notice that individual plots of cotton and food crops are noticeably larger in this county, which is due chiefly to the use of ploughs.”

An increase in ploughing activity was also recorded in the Pallisa County of this district where 456 ploughs are registered compared with 271 in 1927.

Government Plantations.

50. Reports dealing with the work done on the principal Government Experimental Plantations will be found under their separate headings later in this report.

51. The main plantations for experimental and seed production work are:—

(a) **KAMPALA**—close to the new Agricultural Laboratories, where work is carried on with experiments in connection with investigation at the laboratories, agricultural education and experiments with such crops as rubber and coffee. A large nursery is also maintained for raising supplies of *C. robusta* for distribution to natives and for raising stocks of various other plants and seeds. Various varieties of imported sugar cane are also grown on this plantation, which are being propagated as rapidly as possible to supply planting material and for use in experiments of yield and quality.

(b) SERERE in the Teso district in the Eastern Province, is the principal Agricultural Experimental Plantation in the province. It is the headquarters of the Senior Agricultural Officer and the Cotton Botanist and the main work is in connection with cotton. Experimental work with native food crops occupies an important place in the programme of work. It is also a centre for agricultural training of natives.

(c) BUKALASA, in Mengo district in the Buganda Province, is where experimental work is done with cotton, coffee, and other crops.

(d) THE BOTANIC GARDENS, Entebbe, which is the headquarters for meteorological work, is also a centre for the raising and distribution of economic and decorative plants and seeds. The oldest cacao in the country planted in 1901 is to be found in these gardens and these plots now represent almost the only cultivated cacao in Uganda. Records of pod production have been kept since this department took over the gardens from the Forestry Department in 1917. Para rubber (*Hevea braziliensis*) was first introduced into Uganda through Kew in 1901 and was planted in the Botanic Gardens but of this first consignment only one tree survived, which is still growing. Later plantings date from 1904 from seed received from Ceylon.

52. The following extracts are from the report on the Gardens by Mr. E. A. Ruck, Plantation Manager:—

(a) "WEATHER.—The total rainfall for the year—61·48 inches, although 2·60 inches above the average was very unevenly distributed. The rainfall for April—16·64 inches—was exceptionally high. The total number of days on which rain fell was 171, the highest fall for one day being 2·98 inches on 20th April, 2½ inches of this amount having fallen in half an hour.

(b) RUBBER.—The best trees in all blocks have now been marked and on a one-third surface left to right cut and thrice weekly alternate day tapping is being commenced in 1929 to record individual yields to find the best yielders for propagation purposes.

(c) OIL PALMS.—A record of seed production from those palms which have produced seed has been tabulated. The number of palms now in bearing being 67.

There are some exceedingly good yielders in the plot as can be seen from the records and the seed from these palms is now being set aside for propagation purposes.

Little can be done in experimenting to find the oil content of the pericarp as special machinery will be required to obtain accurate records. A fair sample of oil, however, of both hard and soft, was prepared with the assistance of the Government Pharmacist for the Nairobi and Kampala Shows but no accurate data could be obtained as the wastage of oil in depericarping the seed and extracting and refining the oil was bound to be considerable without proper machinery.

There has been no germination of the 3,000 seeds received from the Buitenzorg Experimental Station, Dutch East Indies, although the seeds were treated for early germination as recommended in Auchinlock's report and every care given to them.

(d) HYDNOCARPUS ANTHELMINTICA.—In connection with leprosy relief two consignments of these seeds were received during the year, one consignment in January and the other in July.

There has been no germination of the latter consignment up to the present, but of the former 400 very good plants were obtained, of these, 100 are being sent to Ngora and the remainder handed over to the Conservator of Forests with the exception of about 36 plants which are being planted out near the plot of *H. wightiana*.

(e) DISTRIBUTION OF PLANTS AND SEEDS.—The number of economic and decorative plants and seeds distributed during the year were as follows:—

PLANTS.		SEEDS.		LAWN GRASS.
Economic.	Decorative.	Economic.	Decorative.	Bundles.
4,852	5,331	208 pkts.	310 pkts.	7

(f) INTRODUCTION OF PLANTS AND SEEDS.—A total of fifty-six packets of seed, 2,770 single seed and forty-six living plants were received during the year and thanks are accorded to the following for their contributions:—

Director, Botanic Gardens, Singapore, Straits Settlements.
 Director, Royal Botanic Gardens, Peradeniya, Ceylon.
 Director of Agriculture, Manila, Philippine Islands.
 Director of Agriculture, Seychelles.
 Regius Keeper, Royal Botanic Gardens, Edinburgh.
 Prof. Huan Balme, F.R.H.S., Mexico City, Mexico."

53. Subsidiary stations are also maintained by the department for raising stocks of improved types of seed, and for instructional purposes at Kakumiro and Masaka in Buganda Province, Fort Portal in the Western Province and at Bugusege near Mbale in the Eastern Province.

54. In addition to the above there are several "Lukiko" experimental stations in the Eastern Province, which are maintained by the Native Administration, the organisation and control of the work being in the hands of the Agricultural Officers. The first of these Lukiko plantations was established at Ngetta, near Lira, in Lango district, and the report for the year will be found on page 36.

Other stations have been opened on similar lines at Bubulu in Bugishu and Kamuge in Bugwere.

Agricultural Education.

55. The report of the Acting Superintendent of Agricultural Education will be found on page 15.

Agricultural Laboratories.

56. The reports of the various officers, Entomologist, Mycologist, Botanist and Chemist, will be found under their respective headings further on in this report.

Agricultural Show.

57. In December an Agricultural Show for the districts of Mengo and Entebbe was held in Kampala. This aroused considerable interest and entries were numerous in most sections.

Meteorological Observations, Agricultural Statistics and Circulars.

58. The meteorological observations are now published separately and full details of the Agricultural statistics will be found in the appendices to this report. A list of the circulars published by the department is given on page 60.

Native Staff.

59. Three of the native staff are now members of the Native Civil Service. Much slow and patient training is necessary to raise the standard of the native instructors, but progress is being made in this direction and good work has been done on the several plantations in training natives for this work.

A. R. MORGAN,

Acting Director of Agriculture.

ANNUAL REPORT

OF

THE ACTING SUPERINTENDENT, AGRICULTURAL EDUCATION.

I returned from leave on the 20th February. The Sese Islands were visited, with the Botanist, in March; Kyagwe and Bulemezi Sazas of Mengo district in August, and Masaka district in October.

I took over from Mr. Staples, Superintendent Agricultural Education, on July 2nd, and continued his work until the end of the year.

Makerere College.

The agricultural class at Makerere consisted of seven boys during the first two terms, and of six during the third term. Lectures were given on soils, botany and elementary plant physiology. On two mornings each week the class underwent practical training in agriculture on the Government Plantation, Kampala. Five students taking the medical course also attended the lectures on botany and plant physiology. This completes the first year of their specialised training. Next year they will undergo a year's practical training on the Government Plantation, Kampala, and will attend lectures on the allied agricultural sciences given by members of the scientific staff of the department.

During the first two terms it was necessary to devote considerable time to this class, with the result that it was impossible to devote as much time as one could have wished to the organisation of agricultural work in the various district schools. During the third term Mr. F. W. Hall undertook this side of the work, permitting more attention to be devoted to district educational activities.

The boys have made fair progress during the year, but it would appear that the best type of boy is attracted rather to other subjects than to agriculture. For instance, the medical students mentioned above are decidedly more intelligent than the present agricultural class.

Not only is this the case but the number of students coming forward to take the agricultural course each year is extremely small considering the importance of the industry to the country. This, in my opinion, is due to the lack of agricultural training in the elementary and sub-grade schools.

In the elementary and sub-grade schools the number of potential Makerere students is without doubt very small, but if agricultural training is developed in these schools, the boys who reach Makerere will probably have a leaning towards this subject.

The majority of the boys in the elementary and sub-grade schools receive the whole of their education in these schools and then, their education finished, they return to their homes, consequently any agricultural training they may receive will eventually raise the standard of agricultural practice in the country.

It is with the object of raising the standard of agricultural education in the elementary and sub-grade schools, that the agricultural training courses for normal school teachers have been proposed, as mentioned below.

Normal Schools.

An effort has been made during the latter part of the year to stress, in these schools, the importance of a proper and adequate agricultural training, and to indicate on what lines development can best proceed.

Agriculture is an essential part of the tuition in normal schools, but the amount and value of the training given depends very greatly on the knowledge and keenness of the master in charge.

The boys in these schools, on the completion of their training, become teachers in the elementary vernacular and sub-grade schools. They are, therefore, a very great potential influence towards the improvement of agricultural practice in the country. It was felt that the agricultural training they receive in the normal schools was insufficient to give them a satisfactory knowledge, and with a view to improving this state of affairs a scheme was submitted whereby boys passing out of normal schools would undergo a practical agricultural course on one of the Government plantations, which course would be an essential part of their training. It is hoped that it will be possible to start this work in 1929.

After undergoing such a course the teachers should be in a position to inaugurate agricultural training in the various schools to which they may be sent, and this can gradually be developed during periodical visits of inspection.

The following normal schools were visited during the year:—

The Church Missionary Society at Mukono, Kyagwe, in March, August and September.

The White Fathers' Mission at Bikira, Masaka, in April and October.

The Mill Hill Mission at Nazigo in Bugerere, in March.

The Government normal school, Kampala, in May, September, October and November.

A weekly lecture was given at this school during the three last mentioned months.

The Principals in charge of the schools very kindly put the boys at my disposal during these visits, when short lectures and demonstrations were given.

Intermediate Schools.

The following were visited during the year:—

King's College, Budo, in March and November.

The Mill Hill Mission, Nsambya, in February.

Elementary Vernacular and Sub-grade Schools.

The following were visited during the year:—

The White Fathers' Mission at Katende, Entebbe; Villa Maria, Masaka; Rakai, Masaka; Kitovu, Masaka; Nandere, Bulemezi; Gayaza, Kyadondo; Bamunanika, Bulemezi.

The Church Missionary Society, Nsangi, Entebbe.

Native owned school, Kasawo in Kyagwe.

In a few of these schools, school gardens have been established, but they are, at present, very undeveloped and in many cases, the teachers are unaware as to how best to develop this side of the work.

Girls' Schools.

A course of elementary nature study was given at the High School and Normal School, Gayaza, during September, October and November.

Government Plantations.

Both Kampala and Bukalasa Plantations have been under my supervision. The three-acre model farm at Bukalasa has yielded some interesting results, and the chiefs of Bulemezi have shown great interest in the holding.

Approximately three acres of the proposed model holding in Kampala have been cleared and planted, a house has been built and three cattle purchased. It is hoped to get the remaining three acres cleared next year, and to obtain a man to work the farm.

A. B. KILLICK,

Acting Superintendent of Agricultural Education.

TOBACCO—EXPERIMENTS IN BUNYORO.

I was stationed in Bunyoro for the whole of the year.

Mr. Hazel, Plantation Manager, was posted to Bunyoro on his return from leave in March and took over part of the supervision of the native tobacco crop.

Mr. T. R. Hayes, of the British American Tobacco Company, was sent to Bunyoro at the end of May to watch the crop on behalf of the company and he has given us the greatest assistance in supervising the native growers.

BULINDI.—At Bulindi, operations were confined to the trial of different varieties of tobacco and to the production of seed from selected plants. The rapid extension of the native tobacco crop, however, called for constant instruction in field work and curing operations and it was difficult to find sufficient time to properly supervise the work at Bulindi.

The arrangements with the British American Tobacco Company whereby Government undertook the actual purchase of the native crop too, took up considerable time which might have been more profitably spent in advising growers in the marketing of their crop and attention to work at Bulindi.

A new site bordering on the Hoima—Masindi Road was selected for the plantation.

The trials were confined to heavy types of tobacco suitable for fire-curing and to types which might prove useful for the local market.

The following varieties were used:—"Piet Retief Swazie," "Blue Pryor," "Western," "Hickory Pryor," "B. 1," and "B. 2."

The latter are selections from tobacco which has been grown locally for some years.

Nurseries were sown on the 3rd February and the young plants were put in the field on the 3rd April.

Weather conditions were excellent throughout the growing season. The plants made good progress, and harvesting commenced on the 18th June, and was completed on the 5th July.

The weights of cured leaf obtained were as follows:—

<i>Variety.</i>				<i>Area Planted.</i>		<i>Weight per Acre.</i>
				<i>Acre.</i>		<i>lbs.</i>
Hickory Pryor	...	...	...	$\frac{1}{2}$	...	790
Piet Retief Swazie	...	...	...	$\frac{1}{2}$	...	700
Western	...	...	...	$\frac{1}{4}$	...	599
Blue Pryor	...	...	...	$\frac{3}{4}$	...	580
B. 1	...	...	...	$\frac{1}{4}$	...	600
B. 2	...	...	...	$\frac{1}{4}$	...	572

These weights were on the whole, disappointing, but the weight per acre cannot always be taken as an indication of the value of the crop.

"Western," "Blue Pryor," and "B. 2" gave the best samples of leaf suitable for export purposes and both "Western" and "Blue Pryor" have given over 800 lbs. per acre in other parts of the district.

"B. 2" is a very distinct type. It develops very quickly and is at least a fortnight earlier than the other varieties. It carries very few leaves, and well developed plants, when topped, will average only seven leaves per plant. Its early ripening and fine leaf, however, makes it worthy of further trial and selection.

The "B. 1" selection gives a very large leaf but proves somewhat difficult to cure.

"Hickory Pryor" which is usually grown as one of the brightest yellow cigarette tobaccos, was grown for observations as to its suitability for the local market and, as was expected, did not cure out well as a dark tobacco.

"Piet Retief Swazie" is one of the varieties reported on by the Imperial Institute in last year's report and is likely to prove an important variety for the local market.

"Western" and "Blue Pryor" are two recognised fire-curing varieties and both do well under local conditions.

A consignment of 1,200 lbs. of leaf from this crop was exported to England and samples were submitted to a broker in Hamburg for valuation.

The crop was free from any serious pests or disease. In the nurseries a few plants were attacked by the stem-borer, *Pthorimaea heliopa*, but if all plants with swollen stems are discarded at planting time, this insect causes little trouble.

Grasshoppers caused a certain amount of trouble by eating the young leaves.

Caterpillars of the *Heliothis obsoleta* moth attacked the seed heads but were kept under control by hand picking. This insect which attacks various crops, including cotton and maize, has not so far been observed to damage the young leaves.

Mosaic disease was present and caused some loss in quality and weight.

A second sowing was made on the 21st July.

Planting out was done between the 21st and 28th September.

Weather conditions proved somewhat difficult and some difficulty was experienced in establishing the young plants and filling up blanks.

Harvest commenced on the 7th December and was practically finished by the end of the month.

At the time of writing curing has not been completed so no details of this crop are available.

The stem-borer was entirely absent from the nurseries sown in July.

Cut-worms which caused no trouble in the early crop were very troublesome during the early part of October.

The large cricket also did a lot of damage during the early part of October.

Grasshoppers were again present and did a certain amount of damage, and the caterpillars of the *Heliothis obsoleta* moth were again responsible for some damage to seed heads.

Mosaic disease was present and caused a certain amount of loss.

This disease does not appear to be carried in the soil as plots which were rather badly infected in the first crop and were re-planted with tobacco in September, within three months of the first crop being taken off, were practically free from infection.

About the third week in October, a leaf spot appeared and spread rapidly throughout the fields. Specimens of attacked leaves were forwarded to the Mycologist who reported that no fungus or bacteria was present and suggested that the outbreak was caused either by unfavourable weather or soil conditions. Rather warmer weather prevailed after the first week in November and all subsequent growth was free from attack, the damage being practically confined to the priming leaves.

The very dry and hot weather which is usual at the end of December makes curing of the second crop rather more difficult than that of the earlier crop as the leaf is inclined to dry out too quickly, and heavy watering in the barn is necessary in order to keep up the necessary humidity to assist the early part of the curing.

Two lads were taken as learners with a view to their being sent out as instructors. Both took a keen interest in the work and towards the end of the year were of great assistance and were doing very good work with the native growers.

No experiments were carried out in the production of bright tobacco.

For the present there is no call for bright tobacco for export to England but there may be a limited local market in the near future.

This type of tobacco requires far more care and attention than the dark type and it would not be possible to carry out experiments at Bulindi where there is no house or other buildings.

EUROPEAN PLANTERS.—Seed was issued to twenty-one European planters and some excellent crops have been grown on estates in the Masindi district and also in Kyagwe.

It should be impressed on planters, however, that far more care is necessary, especially in curing and grading.

Fire-cured tobacco must have a distinct creosotic flavour which can best be imparted to the leaf by the smoke from smouldering, dry wood. It is wrong to use old banana stems or other material which, although they may give clouds of smoke, do not give the desired flavour to the leaf.

Some notes on tobacco have been sent out to planters and a paper on the growing and curing of the crop was read at the annual meeting of the Uganda Planters' Association, and although it is not claimed that the methods advocated may not be altered, those methods have proved successful, and planters would do well to follow those instructions until they have had some experience with the crop and are able to judge the effect of any alteration in their methods.

Most of the tobacco grown on European estates has been grown as a catch-crop between young coffee.

THE NATIVE CROP.—The increasing interest taken in the crop by natives is shown by the following figures :—

During 1927, 1,630 lbs. of cured leaf was produced; the early crop for 1928 amounted to 5,400 lbs. and the late crop which is not yet quite ready for marketing is estimated at 35,000 lbs.

Nurseries were established at convenient centres from which plants were distributed and in order to facilitate supervision, the growers were encouraged to work in groups of from ten to twenty men.

Each group erected its own curing shed and, as far as possible, harvesting and curing was carried out on the communal system.

The success of this system depends very largely upon the attitude of the local chiefs and I should like to record my appreciation of the assistance given by most of the chiefs concerned and especially the Gombolola Chief, Benyamini, Musale, of Bujenje; and Samusoni of Buijanga, both of whom have taken a keen interest and given the greatest encouragement to their people.

Hail caused some loss to both the early and late crops. In the case of the early crop damage was confined to tobacco which was not planted until the beginning of May and was still in the field at the end of July and I am of opinion that when planting is done early in April there is very little risk of hail damage.

The damage to the second crop was more severe and was caused on the 19th December by a storm which travelled across from the Budongo Forest and died away in the vicinity of Hoima but which, luckily did not strike the whole of the tobacco area. Incidentally this was the last storm experienced in this locality before the usual hot and dry weather set in and although there is more risk of hail damage to the second crop, it is most unusual for hail to occur at the latter end of the rains.

For marketing, the growers are instructed to grade the leaf into two grades.

One grower whose plot measured 30 yards by 30 yards produced 175 lbs. of No. 1. and 15 lbs. of No. 2. and received in payment Shs. 55/30, while another grower who planted slightly under three-quarters of an acre produced 558 lbs. of No. 1 and 14 lbs. of No. 2, for which he received Shs. 170/20.

The leaf produced is generally of excellent quality and a small consignment of native grown leaf has realised a very good price on the home market. It must be recognised, however, that in dealing with the native crop, the leaf should be re-graded before export and that a certain amount of loss must be expected in re-grading.

A consignment of leaf grown by one of the chiefs was sent to Aden where it is stated to have realised a satisfactory price.

Very close supervision is necessary; there is no market either for local use or export for leaf which is not properly grown and cured.

Applications for seed were received from several parts of the country for distribution to native growers, but it may save misunderstanding if it is recognised that the tobacco crop is considerably more difficult to grow and handle than cotton, that the curing of tobacco means something far different from merely drying the leaves, and that only properly cured leaf is saleable. It is quite useless to give out seeds or plants and expect the natives to produce a saleable tobacco without supervision, and it should be recognised too, that at the present time, the local market for tobacco is not unlimited.

G. T. PHILPOTT,

Plantation Manager.

ANNUAL REPORT OF THE COFFEE OFFICER.

Arabica Coffee.

The following tours of inspection were made during the year :—

KIGEZI DISTRICT.—The native coffee plots (Arabica) were inspected and advice given on the cultivation of the crop and the development of the industry.

BUGISHU DISTRICT (accompanied by the Mycologist).—Instruction was given to the natives on the cultivation of Arabica coffee. In both Kigezi and Bugishu districts the single stem system of pruning coffee has been advised, and shade does not appear to be beneficial. A second tour of Bugishu was made at the beginning of the crop season and recommendations were made on the organisation of the marketing of the crop.

Visits of inspection were made to European estates in Hoima, Mubende and Kyagwe districts during the year.

During the early part of the year I was seconded to act as Plantation Manager of the Kampala Plantation during the absence on leave of Mr. F. W. Hall.

A general account of methods advised for the cultivation of Arabica coffee was given in last year's report and during the year these views were brought to the notice of planters. Instruction in the methods of pruning of coffee grown on the single stem system has been given on all estates visited during the year. The old methods of cultivation, notably the system of clean weeding of plantations, are gradually falling into disuse, and cover crops of leguminous plants, chiefly the Rhodesian Cow Pea (*Vigna sinensis*) have been tried during the past year on some estates.

As an alternative to the use of leguminous covers in plantations, a system of allowing the weeds to grow and then digging them into the soil is being used on some plantations, with the object of improving the soil and reducing the exposure of the surface to rain wash and sun. In this connection it must be understood that all grass weeds must be kept under as far as possible, and especially "lumbugu" (*Digitaria abyssinica*) must be eradicated. The removal of the latter necessitates very thorough hand forking and picking, a very expensive operation, but no other satisfactory method of dealing with this weed has yet been discovered.

My opinions on the cultivation and manufacture of Arabica coffee in Uganda were collected and given in detail in a paper read at the Annual Conference of the Uganda Planters' Association in June. Considerable comment was aroused, and at a subsequent meeting of the Association the paper was read again and each point discussed with the planters present.

The experiments on different pruning systems started during 1927 on the Kampala plantation have been continued during the year, but little information can be derived from them, as on account of the poor soil and dense shade over the whole plot the trees do not make normal growth and the crop is very poor. Suitable land for a second experiment on the various systems of pruning in the open has not yet become available, but during the coming year it is hoped to commence this experiment on the Bukalasa plantation.

As was mentioned in last year's report, the planters of recent years had abandoned the old single stem system of pruning in favour of bush systems. In some instances planters have now found that although larger crops may be obtained for a few years after the change, eventually the crops gradually fall off. In at least one case a return to the old system of single stem is now being made.

Several planters have recently improved their methods of handling the crop after picking and advice was given them to help in this. There is still room for considerable improvement in the manufacture of the crop here, especially in the drying of the parchment and the grading of the crop. The West Indian Barbecue method of drying coffee appears to be an improvement over the system of trays at present being used in Uganda, and efforts have been made to interest the planters in the former system. So far only one small barbecue has been erected, but a few other planters are considering the erection of barbecues.

W. L. MUNN,

Coffee Officer.

ANNUAL REPORT

ON

SERERE EXPERIMENTAL STATION.

Meteorological.

The dry weather conditions of the previous year continued until the end of March and temperatures were unusually high. The rains were later than usual and the total rainfall again very low, being only 45.13 inches.

Cotton—1927 Crop.

Yields from the main crop and increase plots are shown below:—

		<i>Area Acres.</i>		<i>Total Yield lbs.</i>	<i>Yield per Acre. lbs. of Seed Cotton.</i>	<i>Ginning %</i>
Main crop (N. 19)	...	24	...	14,350	...	598
S. G. 29	...	6.1	...	4,954	...	812
S. G. 15	...	2.8	...	2,537	...	960
S. G. 26	...	1.7	...	1,508	...	887

The ginning percentages shown are the results of ginning tests made by Messrs. Foster Bros.

The above yields were very satisfactory and were produced in an exceptionally dry and short picking season. Stainers were hardly to be seen and the grade of the cotton was unusually good.

Labour.

The labour supply was ample for the needs of the plantation until the end of the year, when, owing to the heavy cotton crop in the neighbourhood, labour for picking the Serere cotton was hard to get.

Cotton Crop.

1. MAIN CROP.—The main crop planted at Serere was the new strain S. G. 29 and the area, 34 acres, was made up of 14 acres of June cotton and 20 acres planted in July. Germination and early growth were good and an average yield of cotton is expected. In common with much of the cotton in Teso “blackarm” made its appearance on the crop, but not in the early stages so that its effect here was not serious. Picking commenced early in November and at the end of the year 7,200 lbs. had been picked. Stainers were very prevalent and there is a higher proportion of stained cotton than usual.

2. EXPERIMENTAL PLOTS.—The acreage of land under cotton experiments, dealt with in the report of the Cotton Botanist, was as follows:—

						<i>Acres.</i>
Spacing and Variety Trial	...	...	...	...	...	10
Increase Plots	...	...	...	...	...	2
Progeny Rows, etc.	...	...	...	...	...	2
						—
				TOTAL	...	14
						—

Other Crops.

The Plantation Manager, Mr. P. Chandler, had charge of the experimental work done during the year on the various crops detailed below:—

						<i>Acres.</i>
Bulo (millet)	...	...	...	...	...	16
Maize	...	...	...	...	...	3½
Sim-sim	...	...	...	...	...	4
Groundnuts	...	...	...	...	...	3
Sweet Potatoes	...	...	...	...	...	3½
Beans, Mpindi, Mpokya, Mtama, Buckwheat, Tobacco, Castor Oil, etc.						15
				TOTAL	...	45
						—

GREEN MANURING.

After the spring crops had been harvested all the land on the lower farm not under cotton, was green manured. Blocks 2, 3, and 5 were sown with the Hyacinth Bean (*Dolichos lablab*) in September and the green crop was ploughed in. It should be noted that this plant made a very satisfactory crop for this purpose. It provides a thick cover and seems to need little rain.

BULO—"Wimbi" (*Eleusine*).

The main crop yielded moderately well at the rate of 1,344 lbs. of unthreshed bulo per acre.

VARIETY TRIAL.—A variety trial of the four selections made in 1926 was conducted in a chessboard of twenty 1/40th-acre plots.

RATE OF SEEDING TRIAL.—Three rates of seeding were adopted and five plots of each were sown at 5 lbs., 10 lbs., and 15 lbs. to the acre respectively.

		Seed Rate.					
		5 lbs.		10 lbs.		15 lbs.	
Mean yield per plot	...	27.8	...	31.6	...	32.5	lbs.
Calculated yield per acre	...	1,112	...	1,264	...	1,300	lbs.

COLLECTION OF TYPES.—Thirty-four different types of bulo in local cultivation were grown in small plots for observation.

SIM-SIM.

Seventeen increase plots of sim-sim from Gulu, Masindi, and local selections were grown. It was not a good year for sim-sim at Serere and yields were low owing to attacks of mildew.

VARIETY TRIAL.—A trial of four varieties repeated five times in 1/40th-acre plots was laid down, but the plots were badly washed out by rain after sowing and the figures of yields are therefore very uncertain.

RATE OF SEEDING TRIAL.—This was a similar experiment to that conducted with bulo, the rates being in this case, 2½ lbs, 5 lbs, and 7½ lbs. to the acre:—

		Seed Rate per Acre.					
		2½ lbs.		5 lbs.		7½ lbs.	
Mean yield per plot	...	9.7	...	7.6	...	10.1	lbs.
Calculated yield per acre	...	388	...	304	...	404	lbs.

The seed rate experiments with bulo and sim-sim are of interest in that they show that fair yields can be obtained from quite small quantities of seed per acre, so that from small amounts of seed of a new strain a good bulk could be rapidly increased.

MAIZE.

Three varieties were kept in cultivation and gave satisfactory yields of grain as follows:—

						Lbs. per Acre.
Hickory King	...	...	...	...	...	3,200
Salisbury White	...	...	...	...	...	2,266
Potchefstroom Pearl	...	...	...	...	...	2,700

The above were increase plots from selected cobs.

VARIETY TRIAL.—A trial of the three above mentioned varieties in a chessboard of fifteen 1/40th-acre plots was unfortunately spoiled by thefts of cobs so that no figures can be given.

SPACING TRIAL.—Three spacings were adopted and five 1/40th-acre plots of each were planted. The different spacings had no effect on the yield.

		Yields of Maize in lbs. of Cobs.					
Spacing.		Mean per Plot.		Yield per Acre.			
1 ft. 6 in. by 1 ft. 9 in.	...	...	93.1	...	...	3,724	
1 ft. 9 in. by 2 ft. 3 in.	...	...	94.9	...	...	3,796	
2 ft. 0 in. by 2 ft. 6 in.	...	...	95.5	...	...	3,820	

YIELD OF MAIZE.—Attention is drawn to the good yields of maize which are obtained at Serere, and which no doubt could be obtained in other parts of the Eastern Province. Given facilities for marketing and railway transport there would seem to be a promising future for this crop.

GROUNDNUTS.

Mr. Chandler's report on groundnut experiments is as follows:—

"About 3 acres were under this crop, two of which formed the main crop grown under two cultural methods, the remainder being small increase plots containing three selections of seed from last season's plots.

The two cultural methods applied were : (a) on mounds (three seeds per mound) v. on the flat, broadcast, and (b) cultivation in rows, 1 ft. 3 in. x 1 ft. 3 in. v. sowing broadcast.

Each method was repeated four times (16 plots in all) each plot being one-eighth of an acre.

Sowing was done in May, seed rates equal to 43 lbs. being used for the first method, and 26½ lbs. for the second.

Harvesting was carried out during September and the following yields were obtained :—

(a) Cultivation on mounds	...	...	246 lbs. <i>Unshelled.</i>
(b) Flat cultivation	...	..	212 lbs. <i>do.</i>

These figures show a total of 458 lbs. from the whole acre, with a slight margin in favour of the cultivation on mounds.

The yields obtained from the second method were as follows :—

(a) Cultivation in rows	...	...	312½ lbs. <i>Unshelled.</i>
(b) Broadcast	...	...	264½ lbs. <i>do.</i>

These figures show that a total crop of 577 lbs. was reaped from the whole acre with a good margin in favour of the cultivation in rows.

In laying down these cultural experiments another factor was considered, *i.e.*, class of soil, virgin or otherwise. Both groups of plots were joining each other, the former on virgin soil and the latter on soil previously cultivated, this giving the better result which rather opposes the local native theory that the crop requires virgin soil to get the optimum results.

INCREASE PLOTS.—The small plots of other types grown for this purpose did much better than the two above, two plots of the Gulu type yielding at the rate of 1,143 lbs. and 820 lbs. per acre respectively.

Several very marked differences were observed during the growing season of this type, including a sub-erect habit, a distinct shade of green colouring in the foliage, earlier maturing qualities (fully three weeks this season), seeds are smaller and have a deep pink seed coat, and the fruits are produced very near the stem base, an important thing when harvesting.

A plot of Small Japan variety yielded at the rate of 960 lbs. to the acre.

“Rosette” disease was present in all plots to a varying extent and was eradicated from time to time in plots where yield was not the first consideration.”

The following extracts are also from Mr. Chandler’s report :—

“MTAMA (*Sorghum* vars.).

Three small plots, each one-sixteenth of an acre, were sown for increase purposes and comparison of yields, and any further data it might be possible to collect.

Two were local types, one a white seeded the other a red seeded, and the black seeded type received originally as *S. barbuda*.

All were sown on the same day (May 7th) ; seed rate equal to 4 lbs. per acre.

All went well until the plants were reaching the flowering stage (August) when a stem borer became so bad that all stems of the two local varieties had to be cut away and burnt. *Sorghum barbuda* was not troubled to the same extent, but fairly considerably, only 77 lbs. of seed being obtained.

BULRUSH MILLET (*Pennisetum typhoideum*).

Sown at the same time as the preceding millets (*Sorghums*). A plot of equal size, and sown with a similar seed rate yielded at the rate of 1,680 lbs. to the acre.

The stem borers mentioned above did slight damage to this crop, but less than a hundred stems were cut away.

BUCKWHEAT (*Fagopyrum esculentum*).

Two plots of this quick maturing crop were sown during the year for stock, one a quarter acre in April, the other one-sixteenth of an acre in June. Seed rate in both cases was equal to 40 lbs. per acre.

The early sown plot did best, yielding at the rate of 1,432 lbs. per acre, the later one only equal to 784 lbs. Both soil and weather conditions were more in favour of the early plot.

BEANS (*Phaseolus* spp.).

Twenty-three plots of various types were sown during June for increase, each plot one-twentieth of an acre.

All were sown in rows, one foot each way, with two exceptions, the Sword bean (*Canavalia ensiformis*) and another more vigorous one (name unknown at the moment) used for a cover crop and green manuring, which were given an extra six inches both ways.

Harvesting commenced in September with the exception of the above two which were not ready until the end of the year, good yields in most cases being obtained.

Four types gave at the rate of over 1,000 lbs. per acre, while nine others gave over 600 lbs.

SOY BEANS (*Soyeine hispida*, vars.)

A few odd plots were sown to maintain stock, and a moderate yield was obtained in most cases.

CASTOR OIL PLANTS (*Ricinus* spp.).

Small plots of four types according to seed coat colour were sown during June as far as seed was available, approximately three-quarters of an acre in all.

SISAL (*Agave rigida* var. *sisalina*).

Both rope and string making was continued at intervals during the year to supply local needs, as material became available. In addition the fibre was extracted and used as a substitute for twine in the tying of cotton flowers to prevent cross pollination.

Several plants flowered during the year at from 3½—4 years old, the dry flowering stems providing useful poles for temporary buildings and marking-out posts.

Distribution of Seeds.

Approximately 4½ tons of various grain seeds were distributed free for sowing purposes, mostly during the early part of the year, the chief items being wimbi, mtama, maize and groundnuts.

Nursery.

Due to the delayed commencement of the rains both the sowing of seeds and the annual free distribution of fruit tree seedlings were late in consequence.

Approximately 1,110 fruit tree seedlings (various) were eventually given out plus 100 decorative plants, quantities of seeds of both groups, small quantities of sets of pineapples and bananas, and a small amount of seeds of various annuals.

Hydnocarpus spp.—Seed of this genus has been introduced with a view to getting a number of plants established to assist with the cure of leprosy.

Two consignments of *H. anthelmintica* were received during the year, but so far no result has been obtained from either regarding germination. Various methods were tried with seed in a box, such as steeping the seed in water for 48 hours, steeping in very hot water for one-quarter of an hour, treating with sulphuric acid (concentrated) and sowing dry as received.

In addition a bed was sown after just cracking the shell, leaving the kernels intact, but all with the same result.

Ploughing.

This work was somewhat retarded early in the season, due to quarantine restrictions in force to suppress rinderpest in the immediate vicinity. Later it became possible to put from three to six teams in the field daily at favourable intervals, according to the number of trained lads turning up, and the work was carried on right into December, a later date than is usual owing to showers both in November and December.

Most of the ploughing done during the earlier part of the year was concentration on both the cotton and food crop areas, and later the turning in of the old food plots, sowing some with green manure crops as far as seed was available and ploughing the mulch in after, before finally abandoning the work for the season."

Visitors.

During the year the plantation was visited by His Excellency the Governor and by His Excellency the Acting Governor. Other visitors included officers from the Amani Institute and an officer of the Sudan Government Department of Agriculture.

C. E. J. BIGGS,

Acting Senior Agricultural Officer.

ANNUAL REPORT

ON

BUKALASA EXPERIMENTAL STATION.

Climate.

On the whole, climatic conditions were quite favourable for plantation experimental work.

The total rainfall for 1928, 57·48 inches, was a little above the average for previous years.

Only 1·5 inches fell during the first two months of the year, but during March and April conditions were very favourable for the planting of food and other crops.

Cotton planting was possible during June, but was held up by dry weather for most of July. The bulk of the planting was done in August. September, October and November were unusually wet. From August to the end of November, 33 inches of rain fell and during the four days November 8th—11th six inches were recorded.

Dry weather set in after the first week of December.

Labour.

There was an ample supply of fairly good labour throughout the year. All were voluntary. Only about 40% of the labourers are Baganda, the rest being Bacholi, West Nile, and Kavirondo who have settled on, or near, the plantation.

Crops.

COTTON.

The heavy rains just after planting caused some soil wash, and frequent re-sowings of "blanks" had to be made. As these rains continued all through September, October and November, the cotton (especially the earlier sown) produced too much wood and comparatively few bolls.

Flower and boll shedding was rather heavy. However, the first pickings were made at the end of December, and fairly good yields are expected.

The results of this year's (1928-29) cotton experiments will not be available until the end of March, 1929.

COTTON EXPERIMENTS 1927-28: RESULTS.—Some good yields were obtained from the large plots on which N. 17 and N. 35 cotton were grown for increase.

The N. 17 averaged over 900 lbs. per acre and the N. 35 over 800 lbs. per acre.

SOWING DATE AND SPACING EXPERIMENT.—This experiment, designed by the Cotton Botanist, is an attempt to determine the best spacing for cotton at each of the usual sowing dates, on soils of which Bukalasa is typical. It will be necessary to continue the trial for a number of years to obviate seasonal variation.

Details of the experiment and the results of the first year are given below.

There were three sowing dates and five spacings at each sowing date:—

Sowing dates:—July 15th.

July 31st.

August 31st.

It was hoped that a June sowing could be included, but it was not found possible to do this.

Spacings:—4 ft. by 2 ft. (2 plants per hole).

4 ft. by 2 ft. (1 " " ").

4 ft. by 1 ft. (1 " " ").

3 ft. by 2 ft. (1 " " ").

3 ft. by 1 ft. (1 " " ").

Five sub-plots (each one-twentieth of an acre) of each of the five spacings were sown on each sowing date. Hence the total number of sub-plots was 75.

A margin of cotton was sown all round the experiment to eliminate outside edge effect.
Variety of cotton sown—N. 17.
Arrangement of sub-plots—random scatter.

SUMMARY OF RESULTS.

Sowing date.	4 ft. by 2 ft. 2 plants.		4 ft. by 2 ft. 1 plant.		4 ft. by 1 ft. 1 plant.		3 ft. by 2 ft. 1 plant.		3 ft. by 1 ft. 1 plant.	
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
	A	B	A	B	A	B	A	B	A	B
July 15th— Total of the five sub-plots	141½	9½	123¾	9¼	202	14¼	211¾	15¾	294	14¼
July 31st " " " "	121¾	11½	135½	10	191½	13	170¼	9¾	151½	10¾
Aug. 31st " " " "	112	8	86½	6¼	120½	10½	120½	6¾	122	9
Total ...	375½	29	345½	25½	513¾	37¾	502½	32¼	477¼	34

Total weight of cotton from each sowing date:—

	A. quality.		B. quality.		Total.
	lbs.	lbs.	lbs.	lbs.	lbs.
July 15th ...	883¼	...	62½	...	945¾
July 31st ...	770¼	...	55	...	825¼
August 31st ...	561½	...	40½	...	602

Date showing statistical analysis of plot results:—

Sowing date.	Mean yield per plot in lbs. to nearest lb.				
	4 by 2 (2 pts.) lbs.	4 by 2 (1 pt.) lbs.	4 by 1 lbs.	3 by 2 lbs.	3 by 1 lbs.
July 15th ..	30	27	43	45	44
Standard error of mean difference =	4.2				
July 31st ...	27	29	41	36	32
Standard error of mean difference =	3.57				
August 31st ...	24	19	26	25	26
Standard error of mean difference =	4.06				

Spacing.	July 15th.	July 31st.	August 31st.	Standard error of mean difference.
4 by 2 (2 pts.) ...	30	27	24	5.35
4 by 2 (1 pt.) ...	27	29	19	3.98
4 by 1 (1 pt.) ...	43	41	26	2.90
3 by 2 (1 pt.) ...	45	36	25	4.77
3 by 1 (1 pt.) ...	44	32	26	4.19

With regard to the statistical analysis of these results it will be seen that in the case of the earlier sowings, 4 ft. x 1 ft. spacing gave a significant increase over the wider spacings, and this year's results would seem to indicate that a closer spacing than that usually adopted might prove advantageous. Further, weather conditions during the past season would appear to favour early planting.

The experiment will be repeated in 1929.

COTTON VARIETY TRIAL.—There were five varieties each repeated four times, sub-plots being one-twentieth of an acre each.

Varieties :—N. 19
S. G. 15
S. G. 29
N. 35
Local.

Spacing 4 ft. by 2 ft. Sown 21-7-27

GERMINATION.—Average stand per sub-plot after first sowing.

VARIETY.—Average stand per sub-plot (possible stand 240 plants):—

N. 19	...	...	...	...	157
N. 35	...	...	...	...	176
S. G. 15	...	...	...	...	141
S. G. 29	...	...	...	...	168
Local	...	...	...	...	164

All were free from disease or pests, except S.G. 15 which was badly attacked by Jassid.

Yields.—

Variety.	Total Yield per Sub-plot.		Estimated Yield per Acre.
	A Quality, lbs.	B Quality, lbs.	
S.G. 15	62 $\frac{3}{4}$	4	367
S.G. 29	83 $\frac{1}{4}$	4 $\frac{3}{4}$	484
N. 19	75 $\frac{1}{2}$	4 $\frac{3}{4}$	442
N. 35	95	5 $\frac{3}{4}$	554
Local	110 $\frac{1}{4}$	5 $\frac{1}{2}$	685

Mean yield per plot—excluding one plot of each variety, affected by avenue of trees.

			lbs.	
Local	...	...	32	} Standard error of mean difference = 2.6
N. 35	...	...	27.7	
S.G. 29	...	...	24.2	
N. 19	...	...	24.2	
S.G. 15	...	...	20.5	

From the point of view of yield, the local variety would, on these results, appear to be more suited to conditions in Bulemezi than the new varieties from Serere, as it gave a significant higher yield than any of the Serere varieties.

The seed of the varieties S.G. 29, N. 19 and S.G. 15 in the experiment was sown direct from Serere.

Isolated plots of these varieties are now being grown, so that next year seed “once grown at Bukalasa” may be included in the trials. It is possible that larger yields will be obtained from these varieties when they have become more acclimatised to Bulemezi climatic conditions and soil, and the advantage held by local and N. 35 (which gave the largest yields), by having been grown in Bulemezi for some years, will not be so pronounced.

COTTON AND BEANS EXPERIMENT.—The practice of interplanting cotton with various food crops is general in Buganda. With the object of finding out if such interplanting has any effect, adverse or otherwise, on the yield of the cotton crop the experiment detailed below was laid down:—

A. Cotton interplanted with beans.

B. Cotton following beans.

There were 20 sub-plots (each one-fortieth of an acre), and each method of planting repeated ten times.

On ten of the sub-plots beans were sown in the “spring” rains, and harvested in June.

Cotton was sown on all sub-plots in July. On the ten sub-plots which had not been previously sown with beans, beans were sown between the rows of cotton, when the latter was about one foot high.

Yields of Cotton.—

		Total of the 10 Sub-plots.	Yield per Acre.
		lbs.	lbs.
Cotton interplanted with beans	...	183	732
Cotton following beans	...	197 $\frac{1}{2}$	790
Average yield per sub-plot.—		lbs.	
Cotton interplanted with beans	...	18.3	} Standard error of mean difference = 2.3
Cotton following beans	...	19.75	

No significant difference.

The experiment is being repeated in 1929.

AGRICULTURAL CHEMIST'S LIME AND GREEN MANURE EXPERIMENT.—To test the effect of lime, and lime and green manure on the yield of cotton.

There were 18 sub-plots each one-twentieth of an acre.

On six sub-plots lime was applied at the rate of one ton to the acre. On six sub-plots a green manure crop (beans) was grown previous to the planting of cotton. Lime at the rate of one ton per acre was applied at the time of the digging in of the green manure.

The remaining six sub-plots were controls.

Spacing 4 ft. by 2 ft. Planted 18-7-28

Owing to the rather uneven character of the soil, and to the fact that parts of nine of the plots were affected by an avenue of trees, 75 average plants from each sub-plot were chosen. The yields of cotton from these plants were taken and the yield per plot computed from these yields.

Yields.—						lbs.
Lime and green manure	...	...	...	...	...	148½
Lime only	...	...	...	...	...	155½
Control	...	...	...	...	...	162½

Mean yield per sub-plot.—						lbs.
Lime and green manure	...	...	...	24.7	} Standard error of mean difference=	
Lime only	...	...	...	26		
Control	...	...	...	27		1.55.

No significant difference.

This experiment is being repeated in 1929.

AGRICULTURAL CHEMIST'S CROP RESIDUE EXPERIMENT.—To determine the exhaustive effect of the various food crops on the soil as shown by the yield of cotton.

The food crops chosen for the experiment were:—

Beans	Sim-sim
Sweet potatoes	Maize
Groundnuts	

Five plots of each of these food crops were sown in the "Spring" rains. Plots arranged in a latin square.

These are harvested and the yields recorded.

Cotton was sown on all plots in August, and the yield from each sub-plot noted.

During the following rains these same food crops will be sown on the same plots, followed by cotton, and so on for a number of years, after which the relative exhaustive effect of each food crop (as shown by the yield of cotton) should become apparent.

Yields of Cotton (1927-28).—

						lbs.
Cotton after beans (total of 5 sub-plots)	...	...	...	...	...	144
" " maize " " "	...	...	...	...	...	134
" " groundnuts " " "	...	...	...	...	...	120
" " sim-sim " " "	...	...	...	...	...	132

Mean yield per sub-plot.—						lbs.
Cotton after beans	...	...	...	28.8	} Standard error of mean difference = 3.0	
" " maize	...	...	...	26.8		
" " groundnuts	...	...	...	24.0		
" " sim-sim	...	...	...	26.4		

No significant difference.

The sweet potatoes were left down for one year, so that no cotton could be sown on those plots in 1927.

1927-28 was the experiment's first year, and as was expected, there was little difference between the yields of cotton.

The difference should be more marked in a few years when the experiment will provide some useful information, and be of assistance in the building up of a suitable rotation for Buganda.

CONTINUOUS COTTON.

This one-quarter acre plot is now in its third year. The 1927 yield was 116 lbs. or 464 lbs. per acre.

All the above experiments will be repeated in 1929, and a start has also been made (by Mr. Stephens) with cotton selection work on the plantation and in the district.

Food Crops.

The work with food crops during the year has been concerned chiefly with endeavouring to produce larger yields per acre, by means of:—

- (1) Selection: single plant selections and hybridisation.
- (2) Different cultural methods, including rotations.
- (3) Introduction of new varieties.

Yield trials are made of all new or improved varieties, the local seed always being included in the experiment. Any variety which has done well in the yield trial is sown on an increase plot to obtain sufficient seed for distribution.

Although yields are perhaps the most important, there are other desirable characters such as quality and early maturing to be aimed at.

With regard to the latter, it would seem that an earlier maturing variety of maize is desirable—that is, if the maize is to be grown in a rotation. Unless the seasons are particularly favourable, it is very difficult to get the maize harvested and the land prepared for the sowing of cotton much before September, which month, generally speaking, is not a good one for this crop.

The ordinary large, white maize has been crossed with the small, red, early maturing “40 day” maize. Apart from early maturity this cross may also improve the nitrogen content of the white maize. The “40 days” maize has a higher percentage of nitrogenous matter, but yields poorly compared with the white variety.

Yields obtained from “increase” plots during the year were:—

					<i>Lbs. per Acre.</i>
BEANS ...	...	...	Navy ...	...	1,121
			Magaligamanye ...	...	700
			Serere ...	...	1,120
			Mutike ...	...	750
BULO ...	...	...	No. 14 (Magwanozoba) ...	...	2,185
SIM-SIM ..	...	...	Serere No. 2 ...	...	217
MAIZE ...	...	...	P. Pearl ...	...	1,350

RESULTS OF EXPERIMENTS:—

SIM-SIM.

To compare the yield of sim-sim grown: (a) in lines, (b) broadcast.

There were 16 plots (one-fifth of an acre), eight of each method of sowing. Lines one foot apart, plants thinned out to distances of one foot between each.

Yields.—					<i>Lbs. per Acre.</i>
Broadcast (total of 8 sub-plots)	...	...	...	...	213
Lines “ “ “	...	...	...	...	347
Mean yield per plot.—					
Broadcast	...	...	...	27	Standard error of mean difference = 2·7.
Line	...	...	...	43	

A significant difference in favour of planting sim-sim in lines.

Plots sown in lines weeded twice, but it was found unnecessary to give the broadcast plots a second weeding, the sim-sim having kept down the weeds.

SIM-SIM PLANTS GROWN IN LINES.—Large, began to branch 3—4 inches from ground.

BROADCAST PLANTS.—Branches two feet or so from ground, very short branches and few pods.

The broadcast sowing was rather too heavy but the sowers were given no special instructions so presumably they sowed it in the usual native manner.

The experiment will be repeated in 1929 with variations in the amount of seed sown broadcast, and different spacings in the “line” plots.

SIM-SIM VARIETY TRIALS.—Five varieties were repeated five times (latin square):—

Main crop Bukalasa (local seed) unselected.

“ “ “ “ “ selected.

Serere variety No. 1.

“ “ No. 2.

“ “ No. 9.

Sub-plots each one-thirtieth of an acre (approximate).

Sown in lines $1\frac{1}{2}$ ft. x 1 ft.

Yields.—				<i>Total of five Sub-plots. lbs.</i>		<i>Estimated Yield per Acre. lbs.</i>
Serere No. 2	...	...	...	$33\frac{1}{2}$	...	215
Local selected	...	...	...	$32\frac{3}{4}$	...	210
Serere No. 9	...	...	...	$28\frac{3}{4}$	...	184
Local unselected	...	...	...	$27\frac{1}{4}$	...	177
Serere No. 1	...	...	...	$19\frac{1}{2}$	...	125

Average yield per sub-plot.—

				<i>Lbs.</i>	
Serere No. 2	...	...	...	6.7	} Standard error of mean difference = 2.0
Local selected	...	...	...	6.5	
Serere No. 9	...	...	...	5.7	
Local unselected	...	...	...	5.5	
Serere No. 1	...	...	...	3.9	

No significant difference.

Unselected local	...	...	...	...	Earliest to ripen.
Serere No. 1	...	...	...	...	Latest to ripen.
Remainder	...	...	...	...	Intermediate.

The local sim-sim is extremely mixed, and an attempt is now being made to isolate some of these types with a view to future selection for yield, oil-content, and disease resistance.

The following characters have been noted: stem green and pigmented; leaf dark green and light green; flower spot absent, pink spot and dark red spot; pod green and purple, hirsute and glabrous, four loculi and eight loculi.

BULO VARIETY TRIAL, 1927-28.

The varieties were :—Local	...	...	...	} From Toro District.
No. 14 "Mugwanozoba"	...	...	...	
No. 19 "Kobumburiga"	...	...	...	
No. 20B "Wambali"	...	...	...	
No. 11B "Kitama"	...	...	...	

It was intended that all varieties should be repeated five times, but there was insufficient seed of two of the varieties to do this.

Yields.—				<i>Lbs.</i>		<i>Estimated Yield per Acre.</i>
No. 14 (total of five plots)	...	...	...	117	...	526
Local	...	...	...	91	...	410
No. 19	...	...	...	69	...	311
No. 11B (2 plots)	...	...	...	39	...	521
No. 20B (3 plots)	...	...	...	27½	...	246

The experiment was repeated in 1928-29, with the following results:—

				<i>Lbs.</i>		<i>Lbs. per Acre.</i>
Local (total of five plots)	...	...	...	254	...	1,321
No. 14	...	...	...	210	...	1,092
No. 20B	...	...	...	186	...	967
No. 11B	...	...	...	185	...	962
No. 19	...	...	...	182	...	946

Sub-plots one-twenty-sixth of an acre (Latin square). All varieties went down rather badly except the local, which stood up well.

SUMMARY OF STATISTICAL ANALYSIS OF RESULTS.

Average yield per sub-plot.—

				<i>Lbs.</i>	
Local	...	...	...	51	} Standard error of mean difference = 4.1.
No. 14	...	...	...	42	
No. 2B	...	...	...	37	
No. 11B	...	...	...	37	
No. 19	...	...	...	36	

The local variety gave a significant increase over the remainder.

GROUNDNUTS.

A yield trial between the "Bukalasa," local grown type (upright growing) and the "Serere" (spreading type) has again been held.

There were 12 sub-plots (six of each variety), arranged on the strip system. Sub-plots one-sixteenth of an acre. Sown in lines 1½ ft. by 1½ ft. on April 13th, 1928. Seed rate 30 lbs. per acre.

Yields.—		<i>Total of six Sub-plots.</i>			<i>Estimated Yield per Acre.</i>
Bukalasa	...	372 lbs. (unshelled)	...	...	992
Serere	...	801 " "	...	...	2,136

Shelling percentage (% of shelled to unshelled).—

Bukalasa	...	...	...	...	67%
Serere	...	...	...	...	64%

Yield of shelled nuts.—

					<i>Lbs. per Acre.</i>
Bukalasa	...	...	...	...	664
Serere	...	...	...	...	1,377

Average yield per sub-plot.—

Bukalasa	...	...	...	62	} Standard error of mean difference = 8.12.
Serere	...	...	...	133	

A significant increase in favour of the "Serere" variety.

The much larger yield of the "Serere" (spreading type) is noteworthy, but they took much longer to ripen than the local type, and were in the ground for nearly a month longer than the latter. This, it is understood, is the natives' objection to them in the district.

MAIZE.

Yield trial of four varieties.

Varieties: Bukalasa (chiefly Potchefstroom Pearl but not pure).
Potchefstroom Pearl.
Salisbury White
Hickory King.

These varieties were each repeated four times. Spacing 4 ft. by $1\frac{1}{2}$ ft.

		Weight of		Shelled		Shelling		Yield per Acre.	
Yields.—		Cobs.		Maize.		%		Shelled Maize.	
		lbs.		lbs.				lbs.	
Pot. Pearl	...	542	...	284	...	52.6	...	1,420	
Bukalasa	...	349	...	211	...	60.6	...	1,055	
Salisbury White	...	488	...	246	...	50.0	..	1,230	
Hickory King	...	345	...	210½	...	61.0	...	1,052	
Average yield per plot.—				lbs.					
Pot. Pearl	...	...	...	71	}	Standard error of mean difference = 2.41.			
Salisbury White	...	...	...	61					
Bukalasa	...	...	...	52.9					
Hickory King	...	...	...	52.6					

ROTATION EXPERIMENT.—This is now in its second year, and as two of the rotations are six course, each will take three years to complete so that results are not available at present.

There are three rotations, each repeated ten times.

Plots one-fortieth of an acre. The rotations are:—

1	2	3
Sim-sim	Bulo	Cotton and Groundnuts
Cotton	Cotton	
Maize and Beans	Maize and Groundnuts	Sim-sim
Cotton	Sweet potatoes (left down for 11 months)	Cotton and Beans.
Mtama and Groundnuts	Cotton	
Cotton.		

Cotton is the basis of all these rotations and is rotated with the principal food crops. The experiment has its limitations as it only gives us the best of these three rotations, none of which may be the best possible one, but it is hoped to enlarge upon it in the future.

MUHOGO.

During July, 1928, fourteen varieties of muhogo were received from Kampala. Another one was added (kindly sent by the Saza Chief of Bulemezi) so that there are now 15 varieties growing at Bukalasa.

With five of the most common native varieties, a yield trial was arranged. Each variety was repeated five times in a latin square.

The other ten varieties were planted in rows for observation purposes. A short time after planting it was found that several varieties were suffering from Mosaic disease. This will, unfortunately, affect the yield trial.

Below are the names of the varieties now growing, with notes as to extent to which each has been observed to be suffering from Mosaic.

Varieties in the Yield Trial.				Degree to which affected by Mosaic Disease.
Nakitembe	...	...	...	Badly affected.
Mukedi	...	...	...	Affected
Nyumbezunga	...	...	...	Slightly affected.
Nakachachali	...	...	...	Practically free.
Bitamisi...	...	...	...	Quite free.
Other varieties	...	...	...	Mosaic.

West Indian varieties :—

Bobby Hanson	...	...	...	...	...	None.
Grey-hound	...	...	...	...	...	Fair amount.
Brown stick	...	...	...	...	...	None.
Smalling	...	...	...	...	...	None.
Red jacket	...	...	...	...	...	None.
Bunch of keys	...	...	...	...	...	None.

Native :—

Mugowa	...	...	...	...	...	Practically none.
Bitiyuma	...	...	...	...	...	None.
Lulanda	...	...	...	...	...	Fair amount.
Kainja	...	...	...	...	...	A little.

BANANAS.

BANANAS (SWEET).—21 different varieties of sweet banana were received from Kampala and planted out in 1928. All are doing well and are expected to bear fruit towards the end of 1929.

BANANAS (NATIVE MATOKE) EXPERIMENT.—This is to compare the yield from bananas when planted and managed on the Jamaica system, with that when managed in the manner practised by the Baganda.

There are five plots of each method, in each plot 42 suckers were planted in April, 1927, which began to bear fruit in March—April, 1928.

Up to January, 1929, about 200 bunches were harvested, each bunch being weighed and the plot noted.

It is much too early to draw any conclusions at present, but I give below the results so far obtained :—

<i>Method.</i>	<i>No. of Bunches harvested.</i>		<i>No. of Bunches which fell before ripe.</i>		<i>Total No. of lbs.</i>	<i>Average Weight per Bunch. lbs.</i>
Jamaica :—						
Total of 5 plots	...	86	...	23	...	2,242 23
Baganda :—						
Total of 5 plots	...	47	...	24	...	1,126·5 17

The much larger bunch obtained from the Jamaica method, and the much smaller percentage of bunches which fell from this method is noteworthy.

The average weight per bunch is small at present, possibly because the trees have only been planted a year. Bunches are getting larger and during January, 1929, many of over 50 lbs. were harvested, and few below 30 lbs.

The 19 Baganda varieties of Bitoke (each variety repeated 10 times) planted in 1927 began to bear in April, 1928.

SWEET POTATOES.

Native varieties are being collected for yield trials and general observation. There are at present seven varieties each repeated five times on one-twenty-fifth of an acre plot. These will be harvested early in 1929 and more cuttings planted.

It was thought that considerably more than seven varieties had been obtained, but it was afterwards discovered that many varieties each have two or even three different names.

Other Crops.

TOBACCO.

This was grown on the plantation for the first time during 1928, and a good crop obtained.

The seed (Blue Pryor) was sown in the beds during July and planting out commenced in September—October, whenever weather conditions were favourable.

Pruning, topping, and suckering were carried out, and selected plants were “bagged” for future seed supply.

Picking was done on December 20—21st, and the tobacco hung in the curing barn for about a week before the fires were started.

About two acres were planted, but the last half acre to be planted was ruined by a fall of 2·3 inches of rain which fell the day after planting.

It is expected that curing will be finished towards the end of January. The crop was fairly free from disease. A small amount of Mosaic and “frenching” was present and one plant was affected by Granville Wilt.

COFFEE (BEDS).

From Bukalasa about 25,000 young plants of *Coffea robusta* were distributed to Gombolola beds in Bulemezi, and 10,000 older plants given out to individuals in the neighbouring district.

There are at present 75,000 plants in the beds—which will be distributed early in 1929.

About ten acres of land have been cleared in preparation for coffee experiments which will be laid down in March, 1929.

Model Shamba.

This holding was continued during the year on the same lines as in 1927. The man working the shamba proved unsatisfactory and a new man was appointed early in the year.

Considerable interest has been shown by the Administration and by the chiefs in this demonstration and it should serve as an example to native growers of the possibilities of avoiding shifting cultivation and of adopting some simple crop rotation.

Half the "lusuku" was planted up with Robusta coffee, and good crops have been harvested from all plots.

Detailed accounts are being kept and it should be possible after the cotton season to produce a balance sheet showing actual cash returns.

Native Staff.

In July, an assistant (Semu Kesito) was engaged at a wage of Shs. 30 per month, but was dismissed at the end of December.

A headman at a wage of Shs. 50 per month was engaged in October. His work is fairly satisfactory.

General.

STORAGE OF FOOD CROPS.—With the object of trying to find a method by which native growers could keep maize during storage free from attacks of weevil, a system, adopted in Nyasaland, was tried on the plantation.

A native food store was filled with maize interspaced with layers of brown paper and bean meal. It is supposed that weevils will feed on the bean meal to the exclusion of the maize.

As a control a second food store was filled with maize in the ordinary way.

At the time of writing the maize in both stores was still free from damage.

VISITORS TO THE PLANTATION.—His Excellency the Governor visited the plantation on the 16th April; the District Commissioner, Mengo, on 24th August; Kangawo, gombolola and muruka chiefs on various dates.

E. F. MARTIN,

Agricultural Officer.

ANNUAL REPORT

ON THE

GOVERNMENT PLANTATION, KAMPALA.

Labour.

The supply of labour was ample throughout the year.

Weather.

Throughout the year conditions have been favourable for all crops. Temperatures have at times been rather higher than usual during the day. The rainfall was a little below normal, and occasional heavy storms were experienced, the highest fall being 2.14 inches, which occurred on the 25th March. Total rainfall for the year was 48.98 inches, recorded on 159 days. The average rainfall for the last six years is 50.76 inches.

Sugar Cane.

Work on this crop has been confined to the propagation of stock of the new varieties introduced during the past twelve months.

Coffee.

In the nursery the raising of *Coffea robusta* for distribution has received a good deal of attention and the number of plants, seeds and seedlings given out during the year is as under. All this stock has been raised from seed selected by the Botanist and Coffee Officer.

<i>Seed lbs.</i>			<i>Seedlings.</i>			<i>Plants.</i>
131½	...	...	125,009	...	...	50,387

Of the above only plants were distributed direct to the natives, the others going to the district nurseries.

Rubber.

Experiments commenced in 1927 were continued throughout the year and others commenced.

SELECTION OF HIGHER YIELDERS.—No further trees beyond those selected in 1927 have shown favourably high yields, and of the 28 trees selected probably only four are likely to prove of value for budding purposes. Selected seed was received from Ceylon during the year but germination was nil.

BUDDING.—A fair amount of trial budding was undertaken towards the end of the year, the method adopted being that employed in the East. Students were employed on the work but it was evident that they will require a fairly long training before they can be considered efficient. The non-success of the earlier buddings indicated that one or more of three factors, *viz.*, binding, situation of stock, or length of time buds were wrapped up, were the cause of failure. These factors were therefore investigated with the result that successful budding was accomplished by increasing the tension on the binding of the buds, and in removing the bindings at 14 days.

With the object of carrying out field experiments, as early as possible, to test the value of some of the selected high yielding trees on the plantation, approximately one acre of ground has been planted up with seedling stock, but it is not expected that these can be budded before late 1929 or early 1930.

PREVENTION OF EROSION.—A small area of rubber has been prepared as a demonstration plot of the methods that can be adopted to reduce soil erosion completely or very much. There is complete terracing, *i.e.*, one terrace adjoins the next suitable for slopes of about 1 in 10; platform terraces where there is untouched land between the terraces suitable for slopes of 1 in 7 to 10; and large, long contour catch pits suitable for steeper slopes. Though all of these methods should be combined with a cover crop, the first mentioned is, in itself, completely efficient in stopping erosion.

Medicinal Plants.

There are a fair number of plants of *Picralima kleiniana* and *Hydnocarpus wightiana* established on the plantation. Of the former two have flowered and are producing fruit. The *Hydnocarpus* on the other hand though two or three flowered no fruit was set. A few plants of *Hydnocarpus anthelmintica* are on hand awaiting favourable weather for planting out.

Other Crops.

CASSAVA.—Owing to the fact that no report was written for 1927 the result of a rather significant experiment carried out early in that year is given here.

The experiment in the first place was laid down to find out whether cuttings from diseased plants remained diseased also, if those from healthy plants remained healthy and whether the disease could be transmitted by interplanting the two types. The disease in question, sometimes called curly leaf is thought to be due to a virus in the sap. The leaves are generally reduced, distorted, discoloured, and growth is not so strong as in healthy plants.

The plants remained true to type, *i.e.*, the diseased cuttings produced diseased plants, the healthy, healthy plants, nor was the disease transmitted.

Though these points are important the most serious aspect of the disease lay in the yield of tubers, and the following brief note taken from the monthly report for June, 1927, is sufficient to show the seriousness of the disease, without going into the full statistical data.

There were only 12 roots of each. The mean yield of the diseased plants was 20·8 ozs. and the healthy 158·4 ozs.

IMPORTED VARIETIES.—Several varieties of Cassava were imported from the British West Indies in 1927, and they were planted out alongside local varieties for increase purposes. Towards the end of 1928 they were all dug out.

The yields though not comparable were interesting. The West Indian varieties produced an average of 353 lbs. per 24 roots; the local varieties only 171 lbs.

Stock of this crop together with all varieties of plantains and bananas have been supplied to Bukalasa Plantation where facilities are much better for carrying out experimental work on native crops.

Cover Crops.

The chief cover crops dealt with were as follows:—

RHODESIAN COW PEA, of which fair stocks were raised for distribution, was rather badly affected with a rust.

Centrosema pubescens, an evergreen cover suitable for rubber and recently introduced from Ceylon, has shown satisfactory growth. The amount available being small all seed has been utilized for increase purposes. It grows rather slowly but eventually gives a good cover remaining green even throughout the driest weather, both in the open and under fairly heavy shade.

Desmodium sp., an indigenous leguminous plant has only shown poor progress under shade through coffee. This is not in accordance with the general progress of the plant in the bush and there is not much doubt that the worn-out soil of the plot is responsible.

Nursery.

Work in this section has been mainly centred in the propagation of *Coffea robusta* but the usual raising of fruit trees, etc., has been carried out and the following figures show the distribution of plants and seeds for the year:—

Tea Seed No.		Fruit Trees, etc.			Various Plants.		Cuttings.
		Plants.	Seed. lbs.		Plants.	Seed. lbs.	
283	...	5,160	160	...	6,795	125	900

Bees.

Several home-made hives have been put into use, but the lack of excluders has held up operations. The bees are under the charge of the Coffee Officer.

F. W. HALL,
Plantation Manager.

ANNUAL REPORT

ON

THE NGETTA PLANTATION.

This plantation is maintained by the Native Administration and a sum of money is allocated each year for its upkeep. The control and organisation of the experiments and the general management of the plantation are in the hands of the Agricultural Officer.

Ngetta, which is situated within three miles of Lira, the administrative headquarters of Lango District in the Eastern Province covers an area of thirty-six acres, thirty-two of which are under cultivation and the remaining four acres are under buildings, etc. In addition to the above there is a small orchard for fruit trees and bananas, a nursery and a triangular plot of approximately $2\frac{1}{2}$ acres between the farm and the Kitgum road which was cleared during the year to make the farm visible from the road.

A large cotton seed store was built this year by the Public Works Department for this department. The store is situated near to the farm boundary and it will be very useful for storing the farm crops during the off-season.

Training and Instruction.

The training of pupils was proceeded with on a slightly larger scale this year. The total number of lads who commenced the course was 19. Of these four left of their own accord, six were weeded out, eight were appointed as Cotton Instructors and one remains for further training.

It is intended in 1929 to train five pupils from Chua, five from Gulu, and five from Lango. At the time of writing the Gulu and Chua lads have arrived, and it is hoped to complete the number for Lango early in January.

A pupil is paid the ordinary porter's wage during training. He is made to work like an ordinary employee except when attending lectures and demonstrations. Greater attention is thus paid to the practical side of farming so that when he eventually becomes an instructor he can teach the peasant by actual demonstration the proper way to cultivate either with a plough or any other implement. A sufficient amount of theory is included in the course to enable him to speak with a certain amount of authority. There is also another reason for emphasising the practical side, namely to instil into his mind that manual work is not a debased form of labour. The condescending or superior manner adopted by many of the instructors tends to make them disliked by the peasants and it is essential that this should be avoided.

The majority of the Chiefs in Lango visited the farm in July.

Crops.

The main object of the farm is to demonstrate the advantages of proper cultivation and crop management. In addition some selection work is carried out whenever possible and any good seed is distributed to the natives.

The crops on the farm are grown in field form, except for a section of small plots arranged for the experiments of the Cotton Botanist.

The following figures show the average yield per acre from the field plots:—

					<i>Yield per Acre.</i>
					<i>lbs.</i>
Cotton	...	...	...	...	485
Bulo	...	...	...	...	1,522 (grain)
Ground Nuts	...	...	...	...	1,187 (unshelled)
Mtama (Sudan)	...	...	...	...	788 (grain)

Sim-sim and mtama (local variety) were also grown but as the crops are not yet threshed figures are not available.

The high yield of cotton is interesting as it is the average yield over 23 acres—planted from June to August. It was more than double the yield obtained by the Lango peasants during the same season. It was therefore a good example of the advantages of proper cultivation.

All the food crops gave most excellent yields.

Costings.

The costs of production of bulo and groundnuts were ascertained during the year. The bulo crop shews a profit of Shs. 114/41 per acre, and the ground nut crop a profit of Shs. 128/32 per acre. These costings, however, must be carried over a number of years before any information is reliable.

Arrangements are being made for the keeping of a complete cost account record of the farm during 1929, in order to ascertain the costs of production of all crops. Apart from the question of profit or loss, much valuable information will be gained of the number of man-days entailed in the various branches of the work, such as cultivating, sowing, weeding and harvesting. Such information will be invaluable when arranging a rotation for the native.

Poultry.

A varying number (now 19) of Rhode Island Red poultry are kept on the farm. Cock-birds and eggs are sold to the natives to grade up the local breed. There is a keen demand for birds and eggs.

D. STEDMAN-DAVIES,

Agricultural Officer.

NOTES ON COTTON GINNING, ETC..

BY

THE COTTON GRADER.

Cotton Season—1927/28.

1. **QUALITY.**—In the Eastern Province the grade of raw cotton on the average was slightly down and would run Shy Good, except in Lango where it was Good Ordinary but in all cases the lint would class out as A quality (taking A quality as equal to the Liverpool standard Good East African).

Staple as a whole would average Good to Full $1\frac{1}{8}$ inch, the best being not more than Shy $1\frac{3}{16}$ inch.

The worst staple seen in the Eastern Province was in the Usuku area which would only pull out to Shy $1\frac{1}{8}$ inch.

In Busoga district the difference was very marked between N. 17 and the old seed.

N. 17 seed averaging Full $1\frac{1}{8}$ to $1\frac{3}{16}$ inch and the old seed Good $1\frac{1}{8}$ inch.

In the Buganda Province the cotton was on the whole better than that in the Eastern Province.

The classification on the average was—

Raw Cotton	...	...	Good.
Lint Cotton	...	...	Good to Fine (Liverpool standards).
Staple	...	...	$1\frac{3}{16}$ to Full $1\frac{3}{16}$ inch.

2. **HANDLING.**—In far too many cases in the Buganda markets raw cotton was placed on the floor of the store without any precautions having been taken to prevent the cotton coming into contact with the red murrum.

The result of this neglect was very bad, because the cotton, which had been carefully picked over by the native before bringing it in for sale, was ruined, becoming full of dirt, etc., and also being stained to very nearly a foxy red.

At all the railway stations handling cotton large numbers of skids and sheets had been provided but many cases were seen where a lorry would draw up to the skids to unload the bales, but the bales were dropped on to the ground and then rolled a yard or so on to the skids.

3. GINNING.—When visiting a ginnery during working hours at the first glance the cotton looks very good and well cared for, but it is the little things which if not looked after will spoil the cotton.

Oil, which no doubt comes from the ends of the rollers or from the can of a careless greaser will, if allowed into the lint, ruin any fibre with which it comes into contact.

What looks like a small spot of oil on the lint before pressing will, in all probability, be a fair sized piece of damaged cotton after the bale has been subjected to the full pressure of baling.

Another matter is that of allowing dust and dirt to re-enter the lint having been previously taken out, the causes being amongst others, dirty floors and the collection of dust and broken seed which gradually accumulates under the bearings and below the roller.

This can be stopped to a very large extent by placing a small piece of wood at the ends of the fixed knife.

I saw this in practice at one ginnery and it appeared to be working very satisfactorily.

In many cases cotton is left too long on the strippers with the result that the cotton collects dust and has more the appearance of linters than lint.

Cotton—General.

4. STANDARDS.—Standards for "Good" raw cotton have now been issued to all District Officers (except Karamoja) in the Eastern Province, and also four standards have been sent to the Provincial Commissioner, Northern Province, for distribution.

I had hoped to have issued a far larger number this year, but unfortunately this has been impossible owing to circumstances not under my control.

5. LINT COTTON.—A good deal of discussion has taken place with regard to the introduction or not of lint standards.

At the present time we are working on Lint Standards, *i.e.*, descriptions as defined in the Cotton Ordinance.

This kind of standard is unsatisfactory because nobody in this country or in any other, can possibly know with any degree of accuracy how much leaf and dirt is allowed so that the cotton may pass the quality contracted for.

The suggestion to introduce Liverpool Cotton Association standards will help a great deal as these standards are boxes filled with cotton to represent the required grade with the result that cotton can be classed very accurately indeed against these boxes.

It must be clearly understood that these standards only represent grade and that staple does not enter into the question.

NEVILLE G. WRIGHT,

Cotton Grader.

ANNUAL REPORT

OF

THE COTTON BOTANIST.

Mr. Hosking was appointed Assistant Cotton Botanist and arrived at Serere on the 29th September.

Mr. Stephens, Ploughing Instructor, continued to act as Assistant until the 20th February when he proceeded to Katakwi for famine relief work. He returned to Serere on the 7th July and remained there until the 13th October when he was transferred to Bukalasa.

The writer was at Serere throughout the year with the exception of three short safaris in Teso District in connection with the laying out and sowing of the variety trials. The opening of the Agricultural Laboratories, the Planters' Conference and the Departmental Conference were attended from the 19th to 28th June.

Introduction.

Owing to the overlapping of the cotton season over two years the main section of this report is concerned with the results of the 1927-28 experiments, while a short outline of the 1928-29 programme is given at the end.

A more detailed account of the 1927-28 work will be found in the Empire Cotton Growing Corporation's Annual Report of Experiment Stations for 1927-28.

Meteorological.

The year 1928 was exceedingly dry especially in October when the rainfall return at Serere was practically nil. The results of this were shown in the very high rate of flowering which occurred towards the end of October instead of November and December. The flush of bolls occurred in December followed by a smaller peak of bolling in February which was the result of good rains in November.

Very good yields were obtained from all plots at Serere despite the drought conditions, this being chiefly due to constant intercultivation which prevented evaporation.

No serious disease or pest occurred during the season. Blackarm and Angular Leaf Spot did no serious damage. Stainers were practically non-existent until the end of the season so that the percentage of stained cotton was very low.

Jassids caused some damage to the smooth leaved imported varieties and to the strain S.G. 15 especially during the dry spell in October.

Selection Work.

This is the main section of the work at Serere and is proceeding on the same lines as in previous years with the object of selecting out pure strains with high yielding characters.

Sixty-three progeny rows, most of which were re-selections from the 1925-26 crop and where possible from the 1926-27 crop which had failed, were sown in July. The germination was very poor owing to dry conditions after planting and as very little seed was available few blanks could be re-sown.

Fourteen rows were grown from selected plants at Bukalasa, eight being from the Nyasaland variety and the remainder from Meade. The former showed promise of being high yielding strains but the latter had very small bolls and gave low yields per plant with very good quality lint.

Several of the other rows gave very high yields and the bolling curves reached peaks of up to one boll per plant per day. Two strains gave low boll shedding rates 50% as against the normal 65%—75%, these were S.G. 21.7 and S.G. 23.8. The latter showed excellent qualitative and quantitative characters and was selected for small bulk increase in the next season.

Re-selections from S.G. 29 showed improvement in regularity of staple.

Field and laboratory examinations were conducted as described in previous reports, over 40,000 bolls being examined in the laboratory.

Three F. 2 generations of a Sea Island Upland cross were grown but despite excellent initial growth very poor yields were given and hardly a plant gave sufficient seed for an F. 3 generation.

New Varieties.

Several new importations were made during the year including Arizona from N. Rhodesia, Bancroft from South Africa, and Mebane, Kasch and Acala from U.S.A. These were grown in observation rows and suffered badly from Jassid attacks. The rate of boll shedding was very high and few sound bolls were picked from any of the plants.

The main problem confronting us in Uganda is still the production of pure lines of higher yielding capacity. The general quality of the cotton is according to reports satisfactory and the Nyasaland type of cotton still shows superiority over any of the other varieties at present under observation. This type of cotton can produce very high yields on good soils in this country and it is the production of higher yielding strains for the poorer soils which in Teso at any rate form the major portion of the cotton area which is the chief problem at the present time. It is probable that some shorter stapled type will prove more suitable for the extremely poor areas such as Usuku and Nepak.

Small Bulk Increase Plots.

Owing to the failure of the 1926-27 rows no material was available for increase, but a quarter-acre plot was sown with S.G. 7 (Salisbury var.) to form a nucleus for trial in Usuku.

A very poor plot was selected and the resulting yield was at the rate of over 500 lbs. per acre. This variety does not "go off" at the end of the season so rapidly as the Nyasaland type. The staple is short and the lint rather harsh but it is pleasing in appearance and came out first in the spinning tests the results of which are given in the appendix.

The broker's report reads as follows:—

"Strict good middling, light creamy in colour, good staple $1\frac{1}{8}$ th, strong, rather wanting in fineness and lustre. 300 points on."

The results of a quantitative boll analysis are given in Table 1 (page 41)

Medium Bulk Increase Plots.

S. G. 29.—Six acres of this strain were sown in July at a spacing of 5 feet by 2 feet in order to obtain as great a return per seed sown as possible. Germination was very poor owing to the dry weather and as little seed was available few blanks could be re-sown. The resulting stand was poor but the plot was continually intercultivated by means of ox-hoes and as a result of this the drought conditions were overcome and the resulting yield was at the rate of over 800 lbs. of seed cotton per acre.

The produce from this plot was ginned commercially and the ginning outturn was just over 31%. The seed remained true to type being heavily white fuzzed. One bale of lint was sent home under a special mark and a report obtained while a sample of lint was sent home for spinning tests, the results of which are given in the appendix.

The broker's reports were as follows:—

1. Strict good middling, creamy colour, staple about $1\frac{3}{16}$ th. Strong, silky and lustrous. 400 points on.

2. "This bale is very similar to your shipments of A. R. quality. 410 points on."

S. G. 15.—Two-and-a-half acres were sown with this cotton in July, at 5 feet by 2 feet spacing. The resulting yield of over 900 lbs. per acre was in large part due to the fact that the plot on which the cotton was grown was one of the finest pieces of soil on the Plantation as this strain has proved to be lower yielding than the others.

This strain is very susceptible to Jassid attack and re-selections are being made in an endeavour to obtain a resistant strain.

The remarkable fact about this cotton is that it has continually received approbation at the hands of the brokers while the results of the spinning tests have shown that the yarn obtained from it is inferior to most of our other cottons owing to a poor appearance on the blackboards.

The product of this plot was ginned commercially and gave a very low ginning outturn of 27%. A bale was sent home under a special mark. The broker's reports on the lint sent home for a spinning test and the special bale were as follows:—

1. Strict good middling, creamy in colour, staple full $1\frac{3}{16}$ th, strong, silky and lustrous. 450 points on.

2. "This bale is very good grade, very clean and silky white and extra fine staple about $1\frac{3}{16}$ th. In all respects a very desirable cotton from the spinning point of view. 450 points on. This bale is too long and too white to mix with uppers and it is the best East African we have seen and would work well in the yarn by itself."

When these remarks are contrasted with the results of the spinning tests given on page 43, the difficulties confronting the cotton breeder in selecting the most suitable cotton for distribution are manifest.

S.G. 26.—A small plot $1\frac{1}{2}$ acres in area was sown at the last moment in August with this strain on account of a favourable spinning report. Despite the late sowing date a very good stand was obtained and the plot yielded at the rate of over 850 lbs. per acre.

The produce of the plot was ginned commercially and gave a ginning percentage of 29. A bale was sent home under a special mark and the brokers' reports are given below:—

1. Strict good middling, creamy colour, staple $1\frac{1}{8}$ th to $1\frac{3}{16}$ th, irregular. Strong, fairly lustrous and fine. 350 points on.

2. Bale No. 2 (S.G. 26): This is very silky and clean and good staple, about $1\frac{1}{8}$ th to $1\frac{3}{16}$ th. It is rather cut. Value 425 points on. This bale would mix with uppers but in less proportion owing to its whiteness.

TABLE 1.
SUMMARY OF QUANTITATIVE BOLL ANALYSIS OF INCREASE STRAINS.

Strain.	Loculus Number.	No. of Seeds per boll.	Wt. of Seed per boll (grms.)	Wt. Lint per boll (grms.)	Lint Index.	Lint Length.
S.G. 7	4.21	31.08	4.03	1.83	5.8	27.7
S.G. 29	4.03	31.50	3.30	1.86	5.9	31.0
S.G. 26	3.96	30.60	2.96	1.64	5.5	30.3
S.G. 15	4.04	30.20	3.58	1.61	5.3	35.0

Plot Experiments.

VARIETY TRIALS.—Yield trials with the various varieties under observation were conducted at Serere, Ngetta, Simsa and Labori. No significant differences in yield were obtained. In the Serere trial observation rows were demarcated in the plots and growth, flowering and bolling records obtained from them. The results of these indicated that S.G. 27 is the highest yielder while S.G. 15 is the lowest.

In the Serere and Labori trials the Jassid susceptibility of S.G. 15 was very marked and the reddening of the leaves enabled the plots of this strain to be picked out from a considerable distance.

Sowing Date and Spacing Experiment.

This was continued on the same lines as previous years with the addition of two more spacings at each of the three sowing dates. The same plot as the previous year had to be used as no other land was available. The results showed a definite superiority as regards yields of June sowing over July and August and July over August while closer spacings gave significant increases in yield at all three sowing dates. The optimum spacing appeared to be 3 ft. by 2 ft. one plant per hole. In no case did two plants per hole give an increase over one plant per hole. These results are naturally applicable to the season under consideration only and no definite results will be available until this experiment has been conducted over a considerable number of years.

Spacing tests on a small scale (two spacings) were conducted at various centres in Teso and Lango. Most of these trials gave indications of increase in yield due to closer spacing. Table 2 below gives a summary of the results from these plots and forms a good picture of the great variations in yield due to soil and climatic variation.

TABLE 2.
SUMMARY OF YIELDS FROM SPACING TESTS CALCULATED IN LBS. OF SEED COTTON PER ACRE.
(N. 17 seed was used in each case)

Centre.				4 ft. by 2 ft.	3 ft. by 1 ft.
Lango	...	Ngetta	...	760	800
		Kaberaimaido	...	820	1,080
		Aduku	...	560	660
		Dokolo	...	240	360
Teso	...	Katakwi	...	200	218
		Achuna	...	520	560
		Katini	...	360	400
		Labori	...	900	880
		Tira	...	280	320
		Kyere	...	520	480
		Simsa	...	560	620

General.

As in former years numerous samples of seed cotton were sent from the various cotton growing districts for examination. The results of these showed that the introduction of new seed in several areas had been accompanied by a general improvement in quality but there were indications of deterioration in purity due to intercrossing and to mixing of seed in ginneries and

stores. This shows the necessity for a very rigorously controlled scheme for seed distribution such as has been put forward by the Senior Agricultural Officer in a recent memorandum on the subject. Unless some such cut and dried scheme can be adopted the work entailed in the production of pure strains at Serere will be wasted.

The Table below gives a summary of the quantitative characters of most of the samples received:—

Origin.				Lint Length.	C. V.	Seed Wt. 100 seeds.	Lint Index.	Ginning Outturn.	Seed Purity.
BUGWERE	...	Pallisa	...	30.09	8.5	9.84	4.43	31.0	% 78
	...	Kidongole (N 17)	...	30.51	8.3	11.31	5.38	32.2	100
	...	Kibuku	...	27.50	10.6	8.81	4.81	32.9	80
	...	Budaka	...	29.6	9.2	9.70	4.80	32.9	73
	...	Iki Iki	...	29.2	11.5	9.88	4.64	31.7	72
	...	Bugema	...	29.9	9.5	10.61	5.25	33.1	84
BUDAMA	...	Mazimasa	...	28.7	9.8	9.58	4.95	33.4	83
	...	Busolwe	...	29.3	12.4	10.14	4.83	32.3	68
	...	Nagongera	...	29.3	9.4	10.45	4.84	31.7	79
N. BUGISHU	...	Siroko	...	27.8	9.7	10.50	5.28	33.5	80
LANGO	...	Alomet	...	27.90	9.7	9.44	4.81	33.8	89
	...	Ngetta (N 17)	...	32.23	9.4	10.84	4.45	29.1	91
	...	Akorokoro	...	28.01	8.5	11.10	5.56	33.7	100
	...	Abiya	...	28.54	9.9	10.11	5.11	33.5	91
	...	Kalaki	...	31.16	6.2	11.37	5.50	32.6	96
	...	Kangai	...	31.47	5.9	11.28	5.25	31.8	96
TESO	...	Dokolo	...	32.53	7.8	11.43	5.52	32.6	95
	...	Agu	...	29.61	6.9	11.67	5.53	32.2	94
	...	Kyere	...	29.71	7.5	10.60	5.06	32.3	91
	...	Rappayi	...	29.30	9.2	10.03	5.36	34.9	94
	...	Nyero	...	29.53	9.0	10.66	5.27	33.1	97
	...	Ngora	...	32.87	7.5	10.14	4.91	32.6	97
	...	Kelim	...	29.60	8.4	10.87	5.36	33.1	98
	...	Mukura	...	30.70	9.3	10.25	5.05	33.1	99
BUGANDA	...	Kasawa	...	27.56	6.3	11.87	6.27	34.5	88
	...	Wakasa	...	27.03	8.8	10.48	5.26	33.4	99
	...	Buruli	...	29.17	9.8	11.01	5.37	32.8	95
	...	Bulemezi	...	29.30	7.8	10.54	5.33	33.6	80
	...	Bale	...	27.43	9.5	10.75	5.70	34.4	94

SULPHURIC ACID TREATMENT OF COTTON SEED.—Investigations as to the effect of this treatment of cotton seed were continued as owing to its effect in increasing the germination it might prove very useful in ensuring a good stand where very little seed is available. The method was tested under field conditions and the results of this test have been published elsewhere. A great increase in germination was obtained and no deleterious effects were observed.

MIDDLETON GIN TEST.—During the season a careful test was made on the lint ginned by Messrs. Armstrong Whitworth's double roller Middleton gin in use at Messrs. Foster Bros. ginnery at Kadunguru. In a detailed examination of the lint no difference was observed between lint from this gin and from the ordinary single roller Platt's gin.

PUPILS.—As usual a number of young Bateso were employed to carry on routine work such as sowing of flowers and picking of experimental plots which work cannot be done by ordinary porters. These boys received a course in elementary Agriculture so that the more intelligent of them would be fit to be absorbed into the laboratory field staff or as assistant instructors.

1928-29 Season.

Owing to the time of year that this report has to be drawn up no results are yet available from this season's work but a short summary of the programme in hand is given below.

PROGENY ROWS.—Fifty-two rows were sown in July. After planting very dry weather was experienced and hand watering was resorted to, the resulting stand was excellent and very few blanks had to be resown.

The flowering curves reached their peak in December and picking commenced in November.

Blackarm has done considerable damage on this plot, many plants being killed. Owing to the ravages of this disease in Northern Teso special attention is being paid to the possibility of selecting out strains resistant to this disease.

Stainers appeared very early and on this plot hand picking was resorted to as a method of control. The usual field and laboratory observations are being made.

SMALL BULK INCREASE PLOTS.—Four strains S.G. 7, S.G. 27, S.G. 23·8 and B. 1. were sown in segregated plots in July. The last two appear especially promising with regard to habit, yield and quality of lint.

MEDIUM BULK INCREASE PLOT.—A five-acre plot of S.G. 7 is being grown at Toroma in Usuku County to provide a supply of seed for extended trial in this area and for a nucleus for distribution.

BULK INCREASE PLOTS.—S.G. 29 has been selected as being the most promising strain for running up into bulk with the possibility of its replacing the existing commercial seed in the near future. 34 acres were planted at Serere in June and July and a further 24 acres at Simsa. This will provide sufficient seed to sow a segregated mutalla in the 1929-30 season.

Fifty acres of the S.G. 26 strain are being grown by the C.M.S. at Ngora in a segregated plot. The seed from this will be available if necessary and it is hoped that the lint will be sent to England as a separate lot so that a special spinning report can be obtained.

VARIETY TRIALS.—The following strains—N. 17, N. 19, S.G. 7, S.G. 15, S.G. 26, and S.G. 29 are being grown in variety trials at Serere, Ngetta, Kamuge, Labori, Nyero, Katini, Soroti and Katakwi.

NEW VARIETIES.—Three row plots each of the undermentioned varieties are being grown on the Plantation at Serere for selection and stock purposes:—

Mebane, Meade, Lonestar, Acala, Arizona, Bancroft, Webber, Salisbury, Sunflower, Allen, Sea Island and Nyasaland.

SOWING DATE AND SPACING EXPERIMENT.—This is being continued with the addition of a May sowing with seven spacings at each sowing date. In the June sowing five additional plots are being grown on the ridge.

BUD-SHEDDING.—Owing to the very big loss of potential crop from shedding of buds an investigation as to the occurrence and cause of bud-shedding has been initiated this season.

In conclusion, the writer wishes to record his appreciation of the assistance received from the Teso Administration in connection with the conducting of spacing and variety trials in Teso District.

G. W. NYE,

Cotton Botanist.

APPENDIX TO COTTON BOTANIST'S REPORT.

Spinning Tests on Serere Cottons.

Strain.	Nomal Count and Type of Yarn Spun.	Amount of Twist (ins.).	Total Waste.	RESULTS OF SEPARATE TESTS:— Lea Tests (strength in lbs.), and Ballistic tests (work of rupture in inch lbs. per lea).		
				Strength.	Work of Rupture.	Actual Count.
S.G. 7	46's twist.	27·75	4·6	34·1	49·7	47·9
S.G. 15	"	"	4·8	45·6	60·3	46·4
S.G. 29	"	"	6·6	40·4	53·6	47·6
S.G. 27	"	"	6·8	38·9	52·2	47·5
S.G. 26	"	"	6·7	40·3	56·9	46·9
N. 17	"	"	6·0	43·9	56·5	46·4
N. 19	"	"	7·0	44·9	63·1	47·0
Control Arkansas S.M.	"	"	10·0	31·4	43·1	50·0

YARN EXAMINATION.—Very decent yarns, S.G. 7 and control being particularly good. N. 19 gives a very regular thread but is not quite so clear as the first two. The order of merit in appearance is S.G. 7, Control, N. 19, S.G. 26, S.G. 29, S.G. 27, S.G. 15, N. 17.

GENERAL REPORT.—The behaviour throughout was very satisfactory. The samples were very clean and the carding was excellent, the waste losses being low.

S.G. 27 was considered the best cotton and capable of spinning 60's twist or perhaps 64's weft. N. 19 was also commended. In fact all the samples except S.G. 7 had probably been underspun and should certainly make decent yarns at, say, 64's weft. S.G. 7 seems quite a different type of cotton and should not go higher than 46's twist.

Note.—S.G. 7 is a different variety to the other strains it being a selection from Salisbury variety.

The arrangements for conducting these tests were made by the Empire Cotton Growing Corporation, and the writer is much indebted to the brokers who examined the cottons and to the spinners who kindly carried out the tests.

ANNUAL REPORT

OF

THE GOVERNMENT ENTOMOLOGIST.

The Entomologist was on leave from April 14th to November 27th. The Assistant Entomologist returned from leave on June 23rd. Mr. Jones, Laboratory Assistant, was employed from September 8th to December 8th on the mosquito survey of Entebbe.

Mr. Mellor, of the Ministry of Agriculture, Egypt, visited the laboratory and investigated the possible value of the parasites of *Platyedra erebodoxa*, Meyr., for control of pink bollworm of cotton in Egypt.

Pests of major importance which have been investigated during the year include *Antestia* and *Stephanoderes* on coffee, and cotton bugs in relation to transmission of internal boll rot. A preliminary survey of mosquitoes was carried out during the short rains and a report submitted to Government.

Twenty-four visits were paid to non-native estates, and numerous plots of coffee, cotton and food crops cultivated by natives were inspected. Exhibits were prepared for the Kampala Agricultural Show and for the Museum at the Agricultural Laboratories. The number of packages of imported plants examined was 115.

Below are given in some detail under crops the insects of economic importance observed during the year.

Cotton.

In addition to the species of *Dysdercus* named in the report for 1926, *D. cardinalis*, Gerst., has now been identified. Other bugs found on cotton bolls were species of *Capsidæ*:—*Lygus vosseleri*, Popp.; *Deræocoris ostentans*, St.; *Deræocoris* sp. near *oculatus*, Reut.; and *Creontiades? elongatus*, Leth. *L. vosseleri* was the commonest and seemed to be responsible for a proportion of boll shedding. Damage by *Earias* spp. and by *Aphis gossypii*, Glover, was general but *Helopeltis* sp. was uncommon. The following leaf-eating caterpillars caused slight damage:—*Arctornis rubricosta*, Fawcett, *Nygmæa fasciata*, Walk. (both *Lymantriidæ*) and *Cleora acaciaria*, Bdv. sens. lat.: (*Geometridæ*).

Coffee.

1. The bug *Antestia lineaticollis*, St. caused considerable damage, mainly in the Toro area where previously the pest had been confined to one estate. Investigations of the conditions prevailing on the various estates showed in most cases that shade was probably responsible for the attack; with the removal of shade trees the pest disappeared. This may be an indirect effect through soil and host, but more probably it is a direct result of removal of protection of the bug from the effects of cold nights which are normally experienced in Toro. In other cases, bug attack was definitely a result of unsuitable methods of cultivation which had caused loss of soil and humus or had produced a hard pan of soil; in these latter instances the trees were obviously weak and were suffering seriously from *Hemeleia* and die-back.

Experiments were again carried out with sodium arsenite bait* (Tanganyika formula) and proved successful, indicating that the type of sprayer was an all important factor for success. The machine used was a small three pint size "Formalin Sprayer" giving a mist-like spray. With such a machine 150 trees can be sprayed per hour: the cost, exclusive of labour and machinery, was approximately shilling cents 60 per 500 trees. Various esters mixed with the bait were tested as possible attractants but all proved to be deterrents, the poison acting only after the esters had evaporated.

Where labour is suitable and supervision sufficient it is far preferable to control *Antestia* by hand-picking, for in this case, providing the trees are given proper attention and cultivation, the bug gradually ceases to be a pest. The use of poisoned bait seems to be constantly necessary when once it has been undertaken (probably because the parasites of the bug are also killed)—this seems to be the experience in Tanganyika Territory. The newer insecticides, "Komo" and "Flit," are of use only when accompanied by collection of the fallen insects: the adults and at least the larger nymphs are only temporarily paralyzed and they recover after a short time.

* Sodium arsenite $\frac{3}{4}$ oz., jaggery 2 lbs. and water 4 gals.

2. *Stephanoderes hampei*, Ferr., was very prevalent on a number of estates but this pest continued very scarce in the main Toro area. In several instances it was found that densely shaded parts of the estates were acting as reservoirs of infection while damage at a distance from such centres was negligible. Towards the end of the year the parasite *Prorops nasuta*, Waterst., increased appreciably in numbers and at the time of writing is gradually gaining control of the berry-borer. The second species of parasite (*Heterospilus coffeicola*, Schmied) was not found and it was impossible to ship this species to Buitenzorg as requested by the Government of Java.

3. Minor attacks on coffee were made by the following:—*Apate indistincta*, Murr., *Bixadus sierricola*, White, and *Dirphya princeps*, Jord. (stem-borers); *Metadrepina* sp. (leaf-eater)—parasitised by *Echthromorpha variegata*, Brullé, *Xanthopimpla* sp. and a species of *Chalcidæ*; *Virachola* sp. and an unidentified Pyralid (berry-borers). *Coccus* sp. was preyed on by the Noctuid caterpillar *Ozopteryx basalis*, Saalm. The Halticid beetle recorded on coffee in the report for 1925 has now been identified as *Jamesonia weisei*, Jac.

Miscellaneous Crops.

1. SWEET POTATO.—The caterpillars of *Aegeria aericineta*, Meyr., and *Tipulomima pyrostoma*, Meyr.—both *Aegeriidae*—were observed for the first time boring in the thicker stems. A species of *Peloropus* (*Curculionidae*) attacked the stems.

Leaf-eaters included *Brachmia convolvuli*, Wals. (*Gelechiidae*), *Ochyrotica concursa*, Wals. (*Pterophoridae*) and *Acraea acerata*, Hew. The *Charops* sp. which parasitises the last-named is parasitised by *Mesochorus* sp. (*Ichneumonidae*).

2. GROUNDNUT.—Caterpillar of *Spilosoma investigatorum*, Karsch (*Arctiidae*) feeding on the leaves.

3. MAIZE.—*Argyroplote leucotreta*, Meyr., caterpillar attacking the cob (also seed heads of sorghum).

Cicadulina (*Balclutha*) *mbila*, Naude. (*Jassidae*)—vector of streak disease.

4. BEAN (*Phaseolus*).—*Heliothis obsoleta*, Fab., and *Prodenia litura*, Fab., attacking the leaf.

5. PEA (*Vigna*).—*Lamprosema indicata*, Fab. (*Pyralidae*)—leaf-roller. *Laspeyresia campestris*, Meyr., and *Laspeyresia* sp. attacking the pods.

6. CASTOR OIL.—*Argyroplote leucotreta*, Meyr., attacking the seed.

7. TOBACCO.—*Heliothis obsoleta*, Fab.—eating leaf and seed head.

Other Economic Insects.

Dermestes sp. in dried fish.

Xylopertha crinitarsis, Imh. boring in "nkoba" timber. The parasite of *Notolophus vetusta*, Hamps., has been identified as *Apanteles africanus*, Cam.

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2. INSECTICIDES.—Mr. J. C. F. Fryer; Mr. C. T. Gimmingham and Mr. F. Tattersfield.

3. IDENTIFICATIONS.—The staff of the Imperial Bureau of Entomology; H. Bischoff; W. E. China; F. W. Edwards; R. Forsius; F. C. Fraser; J. J. Gillet; G. E. Hutchinson; T. Jaczerewski; R. Kleine; F. Laing; E. Meyrick; F. Muir; J. Obenberger; M. Pic; N. D. Riley; A. Roman; F. Spaeth; J. Waterston; and A. Zimmermann.

4. PUBLICATIONS.—The Governments of South Africa, Egypt, Jamaica, Java, Kenya, New Zealand, Nyasaland and the United States; the Universities of California, Cornell, and Minnesota; the Royal Agricultural Society of Egypt; the Indian Forest Research Institute; C. T. Brues; H. L. Dozier and H. Schouteden.

H. HARGREAVES,

Entomologist.

ANNUAL REPORT

OF

THE GOVERNMENT MYCOLOGIST.

The Mycologist was on duty for the whole year excepting July when he was absent on local leave in Kigezi district. He accompanied the Coffee Officer on a tour of inspection of the native coffee industry on Mount Elgon. Four visits were paid to Lugazi Sugar Estate during the year, chiefly in connection with Mosaic Disease. Special visits to several European estates were paid during the year.

Plant Diseases during 1928.

COFFEE.—The root disease caused by *Rhizoctonia bataticola* (*Macrophomina phaseoli*) occurs sporadically through the plantations. Evidence available indicates that there is no increase in the amount of this disease as compared with previous years.

No cases of attack by *Armillaria mellea* or *Fomes lamaoensis* were found during the year.

A heavy infection of the "Mealy Bug Root Disease" (associated with *Polyporus coffea*, *Pseudococcus* sp. and *Rhizoctonia bataticola*) was reported from one estate. All bad cases were removed and trees in early stages of infection treated with Calcium cyanide dust in the soil around the roots. The best dose has not yet been worked out, nor do we yet know whether the beneficial effects observed soon after treatment are permanent.

Considerable loss of young coffee seedlings due to attack by *Rhizoctonia solani* again occurred in the nurseries on the Government Plantation, Kampala, though the disease was not as serious as during 1927.

HEVEA.—Owing to the fall in rubber prices many estates have stopped tapping, and little attention is being given to diseases. Brown Bast is present on many estates. No further cases of *Rhizoctonia bataticola* root disease have been reported during the year.

COTTON.—The "Sore Shin" disease due to *Rhizoctonia solani* caused little damage during the 1928 planting season. No further cases of wilted plants have been seen.

Angular Leaf Spot was very prevalent during the earlier part of the season around Kampala, but as the plants matured much of the infection was shed with the old leaves, and the disease spread only to a small extent on to the young foliage. In the plots on the Kampala Plantation kept under continual observation the stem form of the disease ("Black Arm") has not developed to date, though at the end of December a considerable number of infections have been found on nearly mature bolls. Reports from the Teso district show a serious infection of the crop with the "Black Arm" form of the disease, associated with an abnormally wet season. Information available indicates that, although the Angular Leaf Spot form of the disease is universally distributed in Uganda, the development of the "Black Arm" form on the branches depends largely on climatic and possibly on soil conditions. In spite of a rather damp growing season in Kampala the "Black Arm" form has not appeared there.

Internal Boll Diseases have been found more commonly in unopened bolls of the present crop than during last season. Bacterial infections show a large increase over the previous year, probably correlated with the present damp season. Reports from the Eastern Province indicate that a heavy infestation of cotton stainers (*Dysdercus*) took place at an abnormally early period in the growth of the crop, so that a considerable increase in Internal Boll Diseases over last year is to be expected.

Mematospora gossypii was found inside seeds of *Hibiscus cannabinus* and *H. esculentus*, the plants having been infested with *Dysdercus*.

SUGAR.—Mosaic Disease is more generally distributed over the infected estate than was the case during 1927, though over the greater portion of the fields the amount of infection is negligible as far as effects on the crop are concerned. Most of the spread took place during the beginning of the year when the roguing gangs were reduced. Since these have been increased the spread has been reduced. Many of the fields are now too high to allow of a proper examination. When the present crop is cut a large increase in the roguing gangs will be necessary to keep the disease in control on the young ratoons. Fields slightly infected last year show little increase in the amount of infection during the year indicating that by a thorough system of roguing the disease can be kept under control. The disease has recently appeared on another small estate close by, but is of very limited extent.

No other disease of sugar cane has caused any appreciable damage during the year.

The importation of new varieties of sugar cane has been continued during 1928, and the varieties imported last year have been propagated as fast as possible, to supply seed pieces for a variety trial to be started in 1929. A considerable supply of tops of the P.O.J. varieties which are resistant to Mosaic Disease will soon be available, and these should help considerably in dealing with the problem of Mosaic.

TEA.—A serious disease of tea was found during the year on one estate. The trees in the field showed a sudden wilting of the foliage, which was the first symptom of disease. Examination of the base of the stem at this stage showed longitudinal cracks in the bark extending down below soil level. On uprooting the trees these cracks were found to extend along one or more roots, especially those near the surface of the soil. In the cracks were found rhizomorphs of *Armillaria* sp. which also extended from the roots into the soil. Isolation trenches were advised and destruction of all infected trees. No new cases have been reported from the infected estate.

TOBACCO.—The “Black Shank” disease (*Phytophthora nicotianæ*) has again caused damage to the imported varieties, but its known distribution is still limited to the Government Plantations at Kampala and Serere. Mosaic of tobacco has been reported from two districts and apparently is increasing in severity.

NATIVE CROPS.—The rust *Uromyces appendiculatus* was particularly severe on some varieties of native beans in Kigezi district; very little crop could be reaped from some plots. Varietal differences in resistance to the rust were very marked, but no attempt is made by the growers to cultivate only the more resistant varieties. *Rhizoctonia bataticola* was reported as causing severe damage to some varieties of beans grown on the Government Plantation, Serere.

MAIZE.—The Streak Disease of maize carried by *Cicadulina* (*Balclutha*) *mbila* has been found to cause damage to the maize crop on Bukalasa and Kampala Plantations. Dr. Storey also found it on grasses of the genus *Digitaria* during his visit here. Up to the present no case has been found in Uganda on sugar cane.

A leaf disease due to *Helminthosporium* sp. caused damage to the maize on Kampala Plantation.

Sorghum in Karamoja district was attacked by *Sphacelotheca sorghi*, but the extent of damage is not known.

NEMATODES (*Heterodera radicola*) were found during the year on banana, robusta coffee and on tomato.

Laboratory Work.

A large number of experiments on the transmission of *Nematospora gossypii* by the cotton stainer (*Dysdercus* spp.) were carried out during the year. The results obtained in the seasons 1926-27 and 1927-28 were collected, and a paper forwarded to England for publication. This work has been continued during the present cotton season, but results are not yet available.

Eleven strains of *Rhizoctonia bataticola* and one of *Rhizoctonia solani* were tested for pathogenicity to seedlings of cotton and *Vigna sinensis*. The seeds were surface sterilised and sown in litre flasks of sterile soil each inoculated with one strain of fungus. The seedlings grown with *R. solani* succumbed to the sore shin disease caused by this fungus, but those exposed to infection by *R. bataticola* remained healthy over a period of two to three months, during the latter part of which they suffered greatly through lack of soil space for normal root development.

Attempts to re-produce the “mealy bug root disease” of arabica coffee have not been successful to date. Infected material was buried in contact with the roots of healthy coffee but no sign of disease on the latter is yet apparent. These experiments will be continued and enlarged in the future, as until the disease can be reproduced artificially, we cannot determine its causation in the field.

Miscellaneous.

A general account of the cultivation and diseases of sugar cane was prepared during the year and is now in the press. Lugazi Sugar Estate was inspected in the company of Mr. M. S. Moody Stuart, formerly Sugar Adviser to Government, on the occasion of his re-visiting Uganda.

During October Dr. Storey of Amani Research Institute visited Uganda and the Mycologist accompanied him to Lugazi Sugar Estate and to Kireka Estate.

The Mycological herbarium was enlarged by collections of fungi from Kigezi, Elgon and Kampala districts. A collection of Uganda fungi forwarded to Kew for identification has not yet been reported on. A large number of fungi have been drawn and described during the year and the records will be taken to England during 1929 for identification.

The Mycologist attended the Annual Conference of the Uganda Planters' Association, and a Departmental Conference, both held in June, on the occasion of the opening of the new laboratories.

In conclusion I have to thank the staff of the Imperial Bureau of Mycology for valuable assistance and Miss E. Wakefield, of Kew, for the identification of fungi collected here.

C. G. HANSFORD,

Mycologist.

ANNUAL REPORT OF THE GOVERNMENT BOTANIST.

Coffea Robusta.

The robusta coffee industry is a comparatively young industry but it shows promise of rapid development in the near future. For this reason as well as for the fact that at the present moment it deserves all the attention that we can bestow upon it,—because all further progress is impeded by the presence of a large percentage of undesirable types and by the lack of knowledge of the proper methods of cultivation and of handling the tree—this crop assumes a major position in the programme of work. The work done during the year on it is outlined below.

SELECTION.—This is the most urgent work, for unlike arabica coffee our robusta as yet consists of a mixture of a large number of different types. As there are not many robusta trees on the Government plantations, selections were therefore made from amongst the trees of growers in various parts of the country. This work has in view: (1) the establishment of the industry on sounder lines by growing the seed of selected trees and distributing the seedlings to growers, (2) the determination of a desirable type or types suited to the various parts of the country. The cultivation of a mixture of types is most unsatisfactory and has caused some dissatisfaction amongst growers but full use was made of this diversity and up till now over 300 individual selections have been made. These trees have been labelled and the seed from each is grown separately in the nursery beds and the selection number of every batch of seedlings issued is being recorded to enable us to study the progeny of each selection as they grow up. Progeny studies will also be made on the Government plantations and it is further hoped to supply all future demands for seedlings from the seed of selected trees. For obvious reasons, it was quite impossible to obtain self-fertilised seed, but if possible, an attempt will be made to procure self-fertilised seed from a few of the selections, for comparison.

VEGETATIVE PROPAGATION.—Later on when more desirable strains are isolated it is hoped to carry out hybridisation work with the most promising strains (as revealed by their progeny performance) and it was therefore necessary to study the possibilities of vegetative propagation in order to establish (what now appear to be) the more promising selections on the Government Plantation at Kampala, for purposes of hybridisation. Budding and grafting were tried, and it was found that for young stocks the best method was that of split grafting. With older trees, shield budding seemed fairly successful during the rainy season. It is hoped to investigate the possibilities of robusta on liberica and excelsa stocks.

SEEDLING DEVELOPMENT.—It was often observed that inferior robusta trees showed chlorophyll deficiency and as there is often a fairly high percentage of chlorophyll deficient seedlings at the time of germination of seed, it was decided to carry out some work along these lines. That is, it is necessary to determine to what extent chlorophyll deficient seedlings are associated with this character in the bearing tree and to what extent, if any, this character is associated with poor yields. The observations are extended to other seedling characters, such as time of germination, growth rate, etc., and to various characters in the tree such as leaf type, habit of growth, etc. Chlorophyll deficient seedlings even when (apparently) completely devoid of chlorophyll, always recover and assume a green colour. Observations in the field appear to indicate the importance of the root system on the performance of the tree and it is hoped later on to extend these observations, if possible, to the underground systems of seedlings.

SEED GERMINATION.—The general practice of sowing out robusta coffee seed is to leave on the parchment but it was observed that, in any batch of seedlings germinating in the nursery, the seed often germinates over a period of about two months and that the parchment often delays the unfolding of the cotyledonary leaves for more than a week. It was therefore decided to carry out an experiment to study the germination of parchment-free seed and of seed treated with cold and hot water for various periods. The experiment is still in progress but so far decidedly distinct differences are shown in the time of germination. The tests will be repeated and additional treatments included.

PRUNING AND HANDLING.—Until selections have been definitely established for production on a large scale little is to be gained by carrying out trials with various pruning systems. However, it is essential that we know something about the response of the tree to various treatments, such as the cutting back of primaries and of the main stem (or stems) as compared with leaving these unchecked; the cutting back at various ages, etc., etc. Such studies have been commenced and it is hoped to obtain some information on the behaviour of trees. Such studies are very necessary

as a preliminary to pruning experiments. No yield records are being kept, for these only become necessary when definite pruning systems are compared. It may be mentioned that it seems possible to isolate a type which needs no regular pruning, as such, but perhaps a little "handling." A definite type of tree will have to be produced first and then will be studied a method of pruning or handling that type, but at present no one system could be evolved that would apply even to a fraction of the trees grown.

HYBRIDISATION.—A number of crosses have been made, using robusta as the female parent and arabica, excelsa, and liberica as the male parents. Back crosses have also been carried out in which robusta was pollinated with pollen from two hybrids, arabica $\times$ robusta and arabica $\times$ excelsa. The former hybrid is practically completely sterile while the latter is almost so. Pollen germination studies will be made. Further hybridisation will be mainly concerned with the reciprocal crosses, including that of existing hybrids.

GROWTH STUDIES.—In order to acquire a more intimate knowledge of the development of robusta coffee in this country, in relation to climatic factors, growth measurements have been commenced. Rate of flowering, period of flowering and other differences will also be recorded. Trees often show marked differences in development, in the periods of flowering and of ripening of the berries. Such differences are correlated with differences in vegetative growth. It is about such developmental differences that we need more definite information. Where possible, the growth of trees under shade will be studied too, for comparison.

Maize.

The cultivation of this crop is now being taken in hand. Only about four varieties have been tested out in the country. A good deal remains to be done both in establishing suitable cultural methods and in the distribution (and control) of superior varieties or strains to native growers. The main lines of work will be the introduction and trial of new varieties, selection of seed and a study of proper cultural methods. A start has already been made with the introduction of more varieties.

Fruit Crops.

Some attention is now being given to the cultivation of tropical and sub-tropical fruits in this country. At present, different kinds of fruit are being introduced for trial in the various parts of the country. Every effort will be made to standardise fruit trees as far as possible. With this object in view some work has already been commenced on the vegetative propagation of citrus fruits and mangoes, and the trial of various citrus stocks will soon be commenced. The trial of various types of buds, of methods of wrapping, etc., are under consideration.

Essential Oil Crops.

At the request of a British firm the possibilities of essential oil production are being investigated. Various indigenous plants are grown for analysis, but in addition some well known essential oil plants are also being introduced for trial.

Miscellaneous.

During the year several visits were made. The first was (with the Coffee Officer) to the district of Kigezi in the Western Province. This was made to study the possibilities of a native coffee industry. The second visit was to the Sese Islands of Lake Victoria to obtain coffee seed for planting on the islands and also to find out what could be done to improve the industry. The last visit was to the Bwamba area in the Toro district to select trees in order to obtain seed for the extension of coffee cultivation in that locality. During the year the collection of plants in the herbarium has been properly arranged and it is hoped gradually to increase the collections. A few hundred plants have been sent to the Royal Botanic Gardens, Kew, for identification. A number of plants, from various quarters, have been received locally for identification.

L. G. C. LIEBENBERG,

Botanist.

ANNUAL REPORT OF THE AGRICULTURAL CHEMIST.

I have been on duty throughout the year.

LABORATORY.—The new laboratory was opened by His Excellency the Acting Governor on June 21st. At that date the water and Mansfield gas services had just been finished and have worked satisfactorily since. These services have been run by the Public Works Department and I would like to record our best thanks to the officers concerned for the able and painstaking way in which they have studied our requirements.

Since that date a number of soils have been analysed for advisory purposes but as the figures are of individual rather than general interest they cannot be published. In future fees will be charged for such analyses if in the opinion of the Director of Agriculture they do not come within the scope of the general soil survey of the Protectorate. Samples of insecticide have been analysed for the Entomologist and samples of swamp water from Entebbe examined in connection with the mosquito survey of that township by the Assistant Entomologist. In addition a number of ash determinations on cotton have been carried out for the Cotton Botanist.

EXPERIMENTAL AND ADVISORY.—The crop residue experiments and liming trials are being continued on the Kampala and Bukalasa Plantations and yield details will be found in the reports on those stations.

On coffee the effects of rotten cotton seed have proved to be entirely beneficial and the elephant grass mulch has also been very effective, especially on one of the older estates which had suffered badly from wash. Planters may now apply either of these materials with every confidence.

It is hoped that during the coming year it will be possible to lay out manurial experiments on coffee using the concentrated fertilisers supplied by Messrs. Nitram Ltd. It should be pointed out, however, that this work will need the co-operation of a number of planters as there is no suitable coffee on the Government plantations. The plots should be arranged chess-board fashion, and the yields recorded accurately, for the work to be of any practical value. The trials will cover a number of years and will be accompanied by detailed soil analyses each year. In this way it will be possible, in time, among the planting community, to extend the advisory work to the science of manuring. It should be pointed out that until exhaustive trials have been conducted giving data showing the correlation between the soil type, chemical analysis and the results of the application of definite fertilisers, it will be impossible to give advice, based entirely on chemical analysis. The main line of attack on all manuring problems is through accurately planned and carefully supervised field experiments. An extension of the system of Government Experiment Stations is desirable and planters must also co-operate with the Agricultural Department to obtain the best results.

On my arrival, four years ago, it was the main object of the coffee planter to have a "clean" estate. This he achieved at great expense by frequent hoeing without realising that he was losing all his soil humus and on the slightest slope, he also lost most of his surface soil by wash. Since then continuous efforts have been made to induce planters to stop clean weeding and to adopt a more useful and economic cultural system. With this end in view another paper was read at the Annual Conference of the Uganda Planters' Association to emphasize the importance of keeping the soil covered both from the points of view of soil erosion and the conservation of organic matter. It is pleasing to note during recent tours in the two coffee districts, Masaka and Bunyoro, that no clean weeded shambas were found and that the elephant grass mulch was being tried. In conjunction with the above work, attempts are being made to find suitable leguminous cover crops the most successful of which is the Rhodesian Cow Pea (*Vigna sinensis*). This plant does not climb the trees and it provides a good cover of material which rots in easily when cut. In addition to examining the possibilities of indigenous *Leguminosae* the Botanist is obtaining the seed of varieties which have had favourable reports from Ceylon.

KATWE SALT.—At the request of the Administration a visit was made in February to the salt workings at Lakes Katwe and Kasenyi to see if any measures could be taken to improve the quality of the product. It was found that the primary cause of the poor quality was the method used for obtaining the salt rather than the chemical composition of the water. The evaporating

pans were made of the black lake mud and dirty water was invariably dipped into the pans from the lake. The result was a discolouration of the salt which dried to a dirty grey or even black colour. It was found that quite a good salt could be obtained by evaporating clean lake water in a small porcelain dish.

A system of sun-baked clay or alternatively cement pans was suggested and a detailed report was submitted to the authorities concerned.

SOIL SURVEY.—At the Agricultural Conference during June a paper was read on the new system of soil classification which is based rather on rainfall and other climatic factors than on chemical constitution or geological origin. In this paper an outline was given of the field observations necessary when sampling. It is hoped and urged that Agricultural Officers when on tour will collect and send in profile samples of each soil type met with, together with notes on the topographical conditions and types of vegetation. Approximate extent of the type soil with details of native cropping and yield would make valuable additions to the notes. It will be seen that the completion of the soil survey alone will be sufficient to occupy three Europeans for a number of years, without any additional advisory work, manurial experiments or general analyses. There is also much research work to be done on questions of soil erosion, loss of humus, rate of nitrification and crop rotations.

Another problem of considerable local importance is concerned with definite areas of sick soils known to the native as "lunyo." There are patches of soil which the native knows to be useless for banana cultivation. There is no superficial difference between "lunyo" and neighbouring fertile soil. Pits have been dug in each and there is no difference in soil depth or profile appearance. Yet the native appears to be able to diagnose the sick areas after an examination of the vegetation.

It is hoped that in the near future there will be a sufficient increase in staff to deal with these problems before almost irreparable damage is done. In the latter event immediate correction will be impossible and desperate remedies have to be adopted at high cost.

W. S. MARTIN,
Agricultural Chemist.

EMPIRE COTTON GROWING CORPORATION.

Report on Sample of Cotton from Bukalasa Plantation.

PRELIMINARY EXAMINATION.

Reference No. of Sample.	Type of Cotton.	Grade and Remarks on Colour.	Length of Staple (fractions of an inch).	Strength of Staple.	Quality and Character of Staple.	Order of Merit.
						<i>Value.</i>
Local ...	American ...	Strict good middling, creamy colour.	Full 1 1/8th irregular.	Medium ...	Lacking in fineness and lustre.	6 14'95d.
S.G. 29 ...	do ...	Strict good middling, high colour.	1 3/16th a little irregular.	Medium to strong.	Fine and lustrous.	3 15'25d. to 15'35d.
S.G. 15 ...	do ...	Strict good middling, creamy colour.	Full 1 1/8th ...	do ...	do do ...	5 15'10d.
N. 3/5 ...	do ...	do do ...	1 3/16th a little irregular.	Strong ...	Fine but lacking in lustre.	1 15'45d.
N. 17 ...	do ...	do do ...	Full 1 1/8th to 1 3/16th.	do ...	Fine and fairly lustrous.	2 15'35d.
N. 19 ...	do ...	Strict good middling, rather high colour.	Full 1 1/8th to 1 3/16th.	Medium ...	do do ...	4 15'25d.

Values based on July American Futures 11'35d.

DATED 17TH JULY, 1928.

WOLSTENHOLME AND HOLLAND.

APPENDIX No. 2.

EMPIRE COTTON GROWING CORPORATION.

Report on Sample of Cotton from the Serere Farm, Uganda.

PRELIMINARY EXAMINATION.

Reference No. of Sample.	Type of Cotton.	Grade and Remarks on Colour.	Length of Staple (fractions of an inch).	Strength of Staple (weak, medium, strong or very strong).	Quality and Character of Staple (lustre, fineness, &c.).	Order of Merit (judged on intrinsic qualities, without reference to amount of dirt, leaf, &c.)
						<i>Value.</i>
S. 1 ...	American ...	Strict good middling, light creamy colour.	Good 1 1/8th ...	Strong ...	Rather wanting in lustre and fineness.	14'00d.
S. 2 ...	do ...	Strict good middling, creamy colour.	Full 1 3/16th ...	do ...	Silky and lustrous.	15'50d.
S. 3 ...	do ...	do do ...	About 1 3/16th ...	do ...	do do ...	15'00d.
S. 4 ...	do ...	do do ...	Good 1 3/16th ...	do ...	do do ...	15'25d.
S. 5 ...	do ...	do do ...	1 1/8th to 1 3/16th irregular.	do ...	Fairly lustrous and fine.	14'50d.
S. 6 ...	do ...	do do ...	1 3/16th mixed with short and irregular.	Medium to strong.	do do ...	15'00d. to 15'25d.
S. 7 ...	do ...	do do ...	Full 1 1/8th to 1 3/16th rather mixed with short.	Strong ...	Bright and lustrous.	15'00d. to 15'25d.

Values based on Middling American 11'03d.

DATED 27TH MARCH, 1928.

WOLSTENHOLME AND HOLLAND.

IMPERIAL INSTITUTE.

Report on Tea from Uganda.

The tea which is the subject of this report was forwarded to the Imperial Institute by the Director of Agriculture and is referred to in his letter No. 431/350 dated the 10th March, 1928.

The product was stated to have been grown and prepared on the Government Plantation, Toro, and it was desired to ascertain its quality and commercial value.

DESCRIPTION.

The sample weighed $1\frac{3}{4}$ lbs., and consisted of tea of fair black colour. After treatment with boiling water, the sample was found to consist mostly of large broken pieces of leaf; some whole leaves were present, varying considerably in size from small to very large, *viz.*, from 0.75 by 0.3 to 2.0 by 0.9 inches. Some stem was also present. An infusion was somewhat deficient in aroma.

RESULTS OF EXAMINATION.

The tea was chemically examined with the following results, which are shown in comparison with corresponding figures recorded at the Imperial Institute for the previous samples from Uganda which were dealt with in Imperial Institute reports dated January 23rd and September 5th, 1914, and January 11th, 1918, and for samples of tea from other sources.

					Present Sample.	Previous Samples from Uganda.	Indian Teas (13 samples).	China Teas (8 samples).	Commercial Blended Sample.
					<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
Moisture ...	...	...	...	...	9.5	8.1—11.2	6.4—7.8	7.1—9.2	8.0
Expressed on moisture free tea.	Caffeine ...	...	...	...	3.88	4.0—5.4	3.6—4.1	2.6—3.7	2.96
	Tannin ...	...	...	...	11.77	10.3—17.0	6.9—11.1	8.3—9.3	13.86
	Hot Water Extract ‡	...	...	...	45.75	...	27.4—35.2*	19.0—27.2*	44.79
	Crude Fibre ...	...	...	...	8.51	...	...	...	12.2
	Total Mineral Matter ...	...	...	...	6.94	4.6—6.2	5.4—6.9	6.0—8.2	6.04
	Ash, soluble in water ...	...	...	...	4.69	...	...	...	3.66
	Ash, insoluble in water (less silica) ...	...	...	...	2.14	...	...	...	2.27
	Silica ...	...	...	...	0.11	...	...	...	0.11

* Ten minutes' infusion.

‡ By Tatlock and Thompson's method.

These results show that the present sample was of normal composition.

COMMERCIAL VALUE.

The tea was submitted to brokers in London, who furnished the following report on its quality and value :—

“DRY LEAF.—Blackish, a little brownish, rather irregular unassorted leaf. The firing has been carried out fairly satisfactorily.

LIQUOR.—Whilst possessing good colour, tastes a little soft and plainish.

INFUSED LEAF.—Uneven, but showing a few leaves of a good colour.

NOTE.—From the appearance of the leaf, the tea has probably been hand-rolled. The firing is fairly satisfactory and we presume the leaf is sun-dried. From the leaf before us, we are of opinion that it would sort up into fairly useful grade. On the whole, the manufacture indicates that there is reason to anticipate a marketable quality when the tea is manufactured under proper conditions. To-day's nominal valuation of the above as unassorted leaf is 10½d. to 11d. per lb.”

On the date of the above valuation Indian tea was realising an average price of 15d., Ceylon 17½d. and Java 11½d. per lb.

REMARKS.

The sample in its present form represents tea of rather mixed grade, the leaf being unsorted. The colour is only fair, and the aroma rather weak. The tea is however of promising quality, and it would be worth while to continue its cultivation and to improve its preparation. If this is done the Imperial Institute will be glad to receive a further sample in due course for examination and valuation.

18TH JULY, 1928.

Native Agriculture—Estimate of Approximate Acreages of Crops under Cultivation.

Province and District.	Potatoes.		Millets.		Cotton.	Coffee.		Rubber.		Sim-Sim.	Ground Nuts.	Chillies.	Maize.	Rice.	Wheat.	Beans.	Peas.	Tobacco.	Sugar Cane.	Cassava.	Tea.	Miscellaneous Crops.		
	Plantains.	Sweet.	English.	Mtama.		Wimbi.	Ro-busta.	Ara-bica.	Para.														Other.	
	ACRES.																							
BUGANDA :—																								
	Mengo	210,000	44,863	510	1,783	13,982	102,000	161	132	100	50	5,087	4,300	170	1,000	66	10,500	545	500	1,569	49,030	..	1,200	
	Entebbe	..	18,000	735	900	150	47,260	630	110	10	..	1,300	2,000	40	2,850	22	8,300	50	..	900	8,500	7	..	
	Nasaka	..	4,500	50	3,000	500	177,000	2,000	500	50	..	150	3,000	500	1,500	..	1,500	500	20	10	1,500	..	..	
	Mubende	..	42,596	165	1,113	12,585	93,140	700	140	184	..	4,522	4,522	127	9,691	2	9,402	89	1,088	192	36,677	..	17	
TOTAL	..	379,000	109,959	1,460	6,796	27,217	200,100	3,791	832	344	50	11,059	12,822	837	15,041	90	29,702	1,184	1,608	2,671	95,707	7	1,217	
EASTERN :—																								
	Busoga	..	31,300	80	3,200	10,500	114,800	251	25	..	..	230	500	400	3,000	100	800	50	35	155	7,000	..	100	
	Budana	..	9,100	..	5,000	28,800	21,590	..	..	..	..	1,800	2,100	10	1,400	2,500	2,000	..	10	25	6,000	..	..	
	Bugwere	..	20,000	..	4,300	30,000	82,170	..	..	..	..	1,100	1,500	20	2,700	1,600	3,000	..	10	50	10,000	..	..	
	Bugishu	..	45,000	9,300	150	1,500	24,000	25,070	..	1,134	2	..	280	720	25	3,750	8,750	2,800	25	10	6,200	..	600	
NORTHERN :—																								
	Teso	..	1,482	..	10,000	97,000	132,000	..	..	..	..	7,500	20,000	50	2,000	580	..	15,000	..	..	50,000	..	..	
	Lango	..	33,000	..	30,000	100,000	71,500	..	..	..	..	30,000	6,000	..	500	120	4,500	25,000	..	..	15,000	..	..	
	Karamoja	..	500	..	..	500	..	..	..	..	..	80	40	..	10	..	10	..	..	..	50	..	10	
	TOTAL	..	150,682	146,800	230	52,000	290,800	447,130	251	1,159	2	..	40,990	30,960	505	13,360	8,650	13,110	40,075	65	340	94,250	..	710
WESTERN :—																								
	Bunyoro	..	7,000	30	500	11,000	9,870	60	210	..	..	8,000	2,000	..	500	..	7,000	500	250*	10	1,200	..	..	
	Gulu	..	30	..	5,300	44,000	12,370	..	1	..	..	18,200	1,000	..	200	25	300	..	3	..	10	..	..	
	Chua	..	3,200	..	15,000	45,000	11,000	..	..	..	..	38,200	400	..	..	..	..	20,200	..	..	500	..	..	
	West Nile	..	..	13	66,500	76,200	8,000	1	6	..	..	22,000	600	2	100	50	..	10,200	..	100	2,500	..	..	
TOTAL	..	7,098	50,200	43	87,300	176,200	41,240	61	217	..	..	86,400	4,000	2	800	75	27,500	10,700	253*	110	4,210	..	..	
GRAND TOTAL																								
	Toro	..	50,000	60	2,020	10,000	3,000	2,400	83	..	..	50	500	15	2,500	350	150	15,800	2,500	150	50	1,800	..	..
	Ankole	..	35,000	50	1,500	35,000	7,250	..	350	..	..	5	200	10	500	2	15,000	10,000	200	5	300	..	100	
	Kigezi	..	8,002	23,339	183	26,730	32,758	..	91	..	..	64	8	101	8,769	..	22,673	25,263	243	67	1,694	..	..	
	TOTAL	..	93,002	59,399	293	30,250	77,758	10,250	2,400	524	..	..	119	708	126	11,769	352	53,473	37,763	593	122	3,794	..	100
TOTAL	..	629,782	366,358	2,026	176,346	571,975	698,720	6,503	2,782	346	50	138,568	48,490	1,470	40,970	9,167	123,785	80,722	2,519	3,243	197,961	7	2,027	

* 90 acres fire-cured export tobacco. All other tobacco acreages cured by native methods.

Native Agriculture—Livestock.

PROVINCE AND DISTRICT.				Cattle.	Sheep.	Goats.	Mules	Donkeys	Pigs.
BUGANDA :—									
Mengo	...	...	...	60,078	23,952	149,592	1	4	20
Entebbe	...	...	...	27,347	18,032	51,040	—	—	—
Masaka	...	...	...	60,271	15,222	47,312	1	2	10
Mubende	...	...	...	32,228	11,172	97,622	—	—	12
TOTAL	...	...	...	179,924	68,378	345,566	2	6	42
EASTERN :—									
Busoga	...	...	...	86,994	21,927	212,128	—	—	—
Budama	...	...	...	68,505	10,429	39,845	—	4	—
Bugwere	...	...	...	71,897	14,462	107,172	—	—	—
Bugishu	...	...	...	141,670	40,371	93,147	—	—	—
Teso	...	...	...	238,279	39,039	7,740	—	14	26
Lango	...	...	...	238,516	35,641	62,564	—	—	—
Karamoja	...	...	...	140,000	400,000	30,000	4	7,000	—
TOTAL	...	...	...	985,861	561,869	552,596	4	7,018	26
NORTHERN :—									
Bunyoro	...	...	...	7,838	7,287	28,991	4	2	—
Gulu	...	...	...	35,632	12,962	29,219	1	21	—
Chua	...	...	...	20,200	18,716	20,043	1	—	—
West Nile	...	...	...	95,000	19,800	24,000	6	2	3
TOTAL	...	...	...	158,670	58,675	102,253	12	25	3
WESTERN :—									
Toro	...	...	...	77,690	34,100	73,250	—	10	15
Ankole	...	...	...	216,986	89,787	136,096	—	10	—
Kigezi	...	...	...	89,030	153,913	75,610	—	2	10
TOTAL	...	...	...	383,706	277,800	284,956	—	22	25
GRAND TOTAL	...	...	...	1,708,161	966,812	1,285,371	18	7,071	96

European Agriculture.

COMPILED FROM RETURNS FROM 218 PLANTATIONS.

Province and District.	Number of Estates.	Total Acreage taken up.	Total Acreage cultivated.	COFFEE.		Para Rubber, Acres.	Tea, Acres.	Cotton, Acres.	Tobacco, Acres.	Maize, Acres.	Miscellaneous, Acres.
				Arabica, Acres.	Robusta, Acres.						
BUGANDA—											
Mengo ...	82	39,389	11,863	2,995	2,914	7,610	—	251	187	65	36
Entebbe ...	19	7,173	2,325	738	387	1,417	75	10	2	—	15
Mubende ...	14	9,562	2,312	1,423	345	464	217	—	—	—	5
Masaka ...	20	6,735	1,708	1,122	382	405	—	—	—	—	—
TOTALS ...	135	62,859	18,208	6,278	4,028	9,896	292	261	189	65	56
EASTERN—											
Busoga ...	8	9,188	1,121	695	148	90	—	8	—	—	270
WESTERN—											
Toro ...	55	25,062	3,372	3,224	60	—	5	—	20	—	73
NORTHERN—											
Bunyoro ...	20	11,988	2,981	2,117	506	1,093	—	15	18	80	80
GRAND TOTAL ...	218	109,097	25,682	12,314	4,742	11,079	297	284	227	145	479

3,885 acres are interplanted with various crops

26 estates comprising 8,256 acres totally undeveloped.

Returns not received from eight registered estates and are not included in above.

In Toro there are many new undeveloped estates not yet registered with the Agricultural Department.

Asiatic Agriculture.

COMPILED FROM RETURNS FROM 33 PLANTATIONS.

Province and District.	Number of Estates.	Total Acreage taken up.	Total Acreage cultivated.	COFFEE.		Para Rubber, Acres.	Sugar Cane, Acres.	Cotton, Acres.	Miscellaneous, Acres.
				Arabica, Acres.	Robusta, Acres.				
BUGANDA—									
Mengo ...	14	13,426	6,565	95	580	810	5,665	20	10
Entebbe ...	5	1,640	215	88	—	70	52	—	5
Mubende ...	2	892	480	200	—	10	215	50	5
Masaka ...	2	1,604	441	5	60	170	110	50	66
TOTAL ...	23	17,562	7,701	388	640	1,060	6,042	120	86
WESTERN—									
Toro ...	2	584	74	74	—	—	—	—	—
NORTHERN—									
Bunyoro ...	1	100	—	—	—	—	—	—	—
EASTERN—									
Busoga ...	7	5,781	1,390	175	75	800	270	30	40
GRAND TOTAL ...	33	24,027	9,165	637	715	1,860	6,312	150	126

635 acres are interplanted with various crops.

Eight estates comprising 2,479 acres are totally undeveloped.

Returns were not received from five estates and are not included in above.

Livestock on European and Asiatic Plantations.

PROVINCE AND DISTRICT.				Cattle.	Sheep.	Goats.	Mules.	Donkeys.	Pigs.
BUGANDA—Mengo	(1)	...	...	185	...	...	2	...	50
	(2)	...	...	41	...	...	2	3	...
	Entebbe	(1)	...	118	...	...	...	...	...
		(2)	...	...	...	...	...	...	...
	Masaka	(1)	...	167	...	...	...	...	...
		(2)	...	10	...	10	...	4	...
	Mubende	(1)	...	721	70	35	...	...	...
		(2)	...	...	...	...	...	...	...
TOTAL	(1)	...	...	1,191	70	35	2	...	50
	(2)	...	...	51	...	10	2	7	...
EASTERN—Busoga	(1)	...	...	45	21	35	...	...	...
NORTHERN—Bunyoro	(1)	...	...	37	2	1	3	1	...
WESTERN—Toro	(1)	...	...	200	9	13	...	7	9
	(2)	...	...	4	...	...	...	...	...
GRAND TOTAL	(1)	...	...	1,473	102	84	5	8	59
	(2)	...	...	55	...	10	2	7	...
				1,528	102	94	7	15	59

(1) European.

(2) Asiatic.

Comparative Statement of Uganda Produce Exported from Mombasa for the Year Ended 31st December, 1928.

ARTICLES.	Unit.	From 1st January to 31st December, 1928.		From 1st January to 31st December, 1927.		INCREASE.		DECREASE.	
		Quantity	£	Quantity	£	Quantity	£	Quantity	£
Cotton, Raw ...	centals	553,944	2,475,327	526,911	1,690,838	27,033	784,489	...	...
Cotton, Seed ...	tons	45,506	323,110	29,500	170,303	16,006	152,807	...	...
Coffee, Raw ...	cwts.	40,855	164,187	43,514	170,407	...	...	3,159	6,220
Rubber, Plantation ...	centals	11,312	54,978	14,463	82,077	...	...	3,151	27,099
Rubber, Wild ...	"	...	...	33	84	...	...	33	84
Chillies ...	cwts.	4,437	25,848	1,308	4,359	3,129	21,489	...	...
Jaggery (Unrefined Sugar) ...	"	125	130	436	425	...	...	311	295
Sugar, Refined ...	"	2,749	4,434	10,161	16,371	...	...	7,412	11,937
Tobacco, Unmanufactured ...	lbs.	8,539	327	...	...	8,539	327	...	...
Groundnuts ...	tons	150	2,636	2	40	148	2,596	...	...
Cacao ...	cwts.	2	6	64	160	...	...	62	154
Sim-sim, Seed ...	tons	115	2,162	718	13,732	...	...	603	11,570
Sim-sim, Oil ...	gals.	1,536	422	88	25	1,448	397	...	...
Ghee (Clarified Butter) ...	cwts.	31	239	...	...	31	239	...	...
Oil Seed, Cake ...	tons	136	847	...	...	136	847	...	...
Skins, Sheep and Goat ...	No.	163,042	8,039	78,411	4,091	84,631	3,948	...	...
Skins, Miscellaneous ...	"	202	14	8	15	194	...	...	1
Hides and Skins, Dry and Dry Salted	cwts.	58,677	257,288	29,619	99,541	29,058	157,747	...	...
Ivory ...	"	329	21,759	499	34,574	...	...	170	12,815
Hippo Teeth ..	"	1	4	2	15	...	...	1	11
Horns ...	"	3	722	4	453	...	269	1	...
Metalliferous Ores, Non-Ferrous	tons	252	50,673	117½	20,875	134½	29,798	...	...
Methylated Spirits ...	gals.	543	94	638	96	...	...	95	2
Timber ...	cu. ft.	2,283	609	4,637	917	...	...	2,354	308
Goods, Manufactured, unenumerated	value.	...	309	...	162	...	147	...	...
Goods, Unmanufactured, "	"	...	293	...	62	...	231	...	...
Miscellaneous Exports ...	"	...	810	...	638	...	172	...	...
TOTALS	£		3,395,267		2,310,260		1,155,503		70,496

Net increase:—£1,085,007.

Comparative Statement of Exports from the Uganda Protectorate.

ARTICLES.	Unit.	Year ended 31st December, 1924.		Year ended 31st December, 1925.		Year ended 31st December, 1926.		Year ended 31st December, 1927.		Year ended 31st December, 1928.	
		Quantity.	£	Quantity.	£	Quantity.	£	Quantity.	£	Quantity.	£
Cotton, Raw ...	centals	514,418	3,486,565	784,152	4,685,992	728,438	3,051,791	526,911	1,690,838	553,944	2,475,327
Cotton, Seed ...	tons	21,083	106,280	21,928	122,790	35,360	191,887	29,500	170,303	45,506	323,110
Coffee, Raw ...	cwts.	41,093	167,696	23,883	139,469	33,211	147,884	43,514	170,407	40,355	164,187
Rubber, Plantation	centals	6,083	18,911	8,058	68,704	13,561	135,619	14,463	82,077	11,312	54,978
Rubber, Wild	"	...	...	...	...	...	...	33	84	...	...
Chillies	cwts.	21,357	35,499	2,257	2,985	1,245	1,715	1,308	4,359	4,437	25,848
Ghee (Clarified Butter) ...	"	3	9	...	...	...	...	...	...	81	239
Oil Seed, Cake	tons	...	...	...	...	...	...	...	...	136	847
Jaggery (Unrefined Sugar)	cwts.	48	33	838	245	272	215	436	425	125	130
Sugar, Refined	"	319	698	4,053	7,447	1,255	1,599	10,161	16,971	2,749	4,434
Tobacco, unmanufactured	lbs.	...	...	...	...	...	...	...	...	8,539	327
Groundnuts	tons	89	1,446	41	820	380	6,023	2	40	150	2,636
Cacao	cwts.	118	499	115	311	10	18	64	160	2	6
Sim-sim, Seed	tons	740	15,602	214	4,523	194	4,130	718	13,732	115	2,162
Sim-sim, Oil	gals.	...	...	...	...	...	...	88	25	1,536	422
Skins, Sheep and Goat	No.	274,915	14,175	55,350	4,014	88,750	5,173	78,411	4,091	163,042	8,039
Skins, Miscellaneous	"	55	26	...	...	...	...	...	...	202	14
Hides, Dry and Dry Salted	cwts.	7,172	24,347	7,027	29,843	7,640	27,357	29,619	99,541	58,677	257,288
Ivory	"	269	22,309	307	28,585	202	18,289	499	34,574	329	21,759
Hippo Teeth	"	30	782	1	9	2	86	2	15	1	4
Horns	"	8	224	1	86	1	346	4	453	3	722
Metalliferous Ores, Non-Ferrous	tons	...	...	...	...	...	...	117½	20,875	252	50,673
Methylated Spirits	gals.	...	...	...	...	...	...	638	96	543	94
Timber	cubic ft.	2,151	328	359	75	5,144	1,703	4,637	917	2,283	609
Goods, manufactured, unenumerated	value	...	274	...	53	...	177	...	162	...	309
Goods, unmanufactured, unenumerated	"	...	352	...	345	...	82	...	£2	...	293
Miscellaneous Exports	"	...	795	...	521	...	340	...	653	...	810
TOTALS	...	...	3,897,995	...	5,096,717	...	3,597,437	...	2,310,260	...	3,395,267

**Details of Machinery at Ginneries in the Uganda
Protectorate—Season 1928.**

PROVINCE AND DISTRICT.	Ginneries (working).	GINS.		Seed Openers.	PRESSES.		ENGINES.			DELINTERS.
		Roller.	Saw.		Hand.	Power.	Steam.	Oil.	Suction Gas.	
EASTERN—										
Busoga ...	24 (12)	322	6	24	11	14	21	3	1	1
Budama ...	4 (3)	41	10	3	...	4	3	...	1	...
Bugwere ...	9 (4)	107	5	9	2	7	7	1	1	...
Bugishu ...	3 (1)	39	...	3	2	2	3	...	...	...
Teso ...	19 (6)	211	11	19	10	13	9	...	11	1
Lango ...	12 (4)	119	1	12	5	9	9	1	3	...
TOTAL	71 (30)	839	33	70	30	49	52	5	17	2
BUGANDA—										
Mengo ...	40 (5)	488	5	41	13	24	26	6	9	2
Entebbe ...	10 (1)	100	3	11	4	6	9	1	...	2
Masaka ...	5 (5)	60	1	5	...	5	5	...	...	...
Mubende ...	9 (3)	98	...	9	8	1	9	...	...	...
TOTAL	64 (14)	746	9	66	25	36	49	7	9	4
NORTHERN—										
Bunyoro ...	4 (1)	32	2	3	1	3	3	1	...	...
Gulu ...	4	42	...	4	2	2	4	...	...	...
Chua ...	1	12	...	1	1	...	1	...	...	...
West Nile ...	1	...	2	...	...	1	1	...	...	...
TOTAL	10 (1)	86	4	8	4	6	9	1	..	...
WESTERN—										
TORO ...	1	6	...	1	...	...	1	...	...	...
Ankole ...	— (1)	...	...	...	...	...	...	...	...	...
TOTAL	1 (1)	6	...	1	...	...	1	...	...	...
Machinery at non- working ginneries—	146 (46)	1,677	46	145	59	91	111	13	26	6
EASTERN PROVINCE ...	30	124	70	14	34	8	11	13	6	...
BUGANDA PROVINCE ...	14	120	5	12	10	2	12	2	...	...
NORTHERN PROVINCE ...	1	10	...	1	1	...	1	...	...	...
WESTERN PROVINCE ...	1	...	1	...	...	...	1	...	...	...
GRAND TOTAL	192	1,931	122	172	104	101	136	28	32	6

NOTE :—The figures in brackets indicate the number of non-working ginneries.

LIST OF CIRCULARS OBTAINABLE FROM THE DIRECTOR OF AGRICULTURE, KAMPALA.

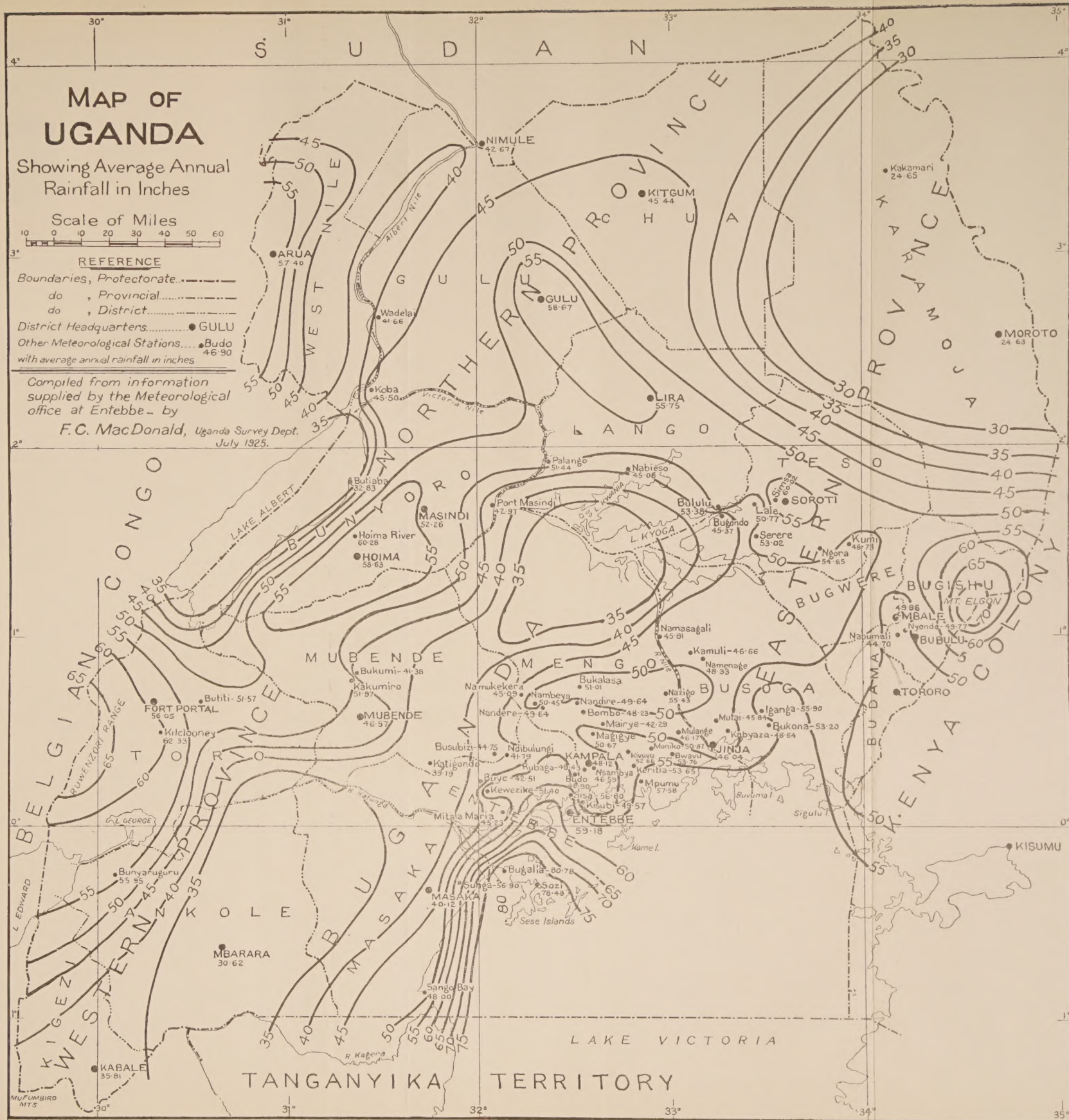
- No. 2.—COTTON CULTIVATION.
- No. 3.—DISEASES OF *Hevea brasiliensis* IN UGANDA.
- No. 4.—DIE-BACK OF *Coffea arabica* IN UGANDA.
- No. 7.—REPORT ON COFFEE CULTIVATION IN UGANDA.
- No. 8.—DISEASES OF CEREALS IN UGANDA.
- No. 9.—DISEASES OF *Coffea arabica* IN UGANDA.
- No. 13.—COFFEE BUG (*Antestia lineaticollis* STAL.,
VAR.).
- No. 14.—COFFEA ROBUSTA IN UGANDA.
- No. 15.—CULTIVATION AND PREPARATION OF COFFEA
ROBUSTA.
- No. 16.—COTTON EXPERIMENTS 1925-26.
- No. 17.—(A) THE OCCURRENCE OF ANGULAR LEAF-SPOT
OF COTTON IN UGANDA.
(B) ROT OF HEVEA CORTEX IN UGANDA.
- No. 18.—RUBBER EXPERIMENTS ON THE GOVERNMENT
PLANTATION, KAMPALA.
- No. 19.—SUGAR CANE IN UGANDA.
- No. 20.—NOTES ON THE CULTIVATION, CURING AND
PACKING OF FIRE-CURED TOBACCO.

Showing Average Annual
Rainfall in Inches

Boundaries, Protectorate.....
do , Provincial.....
do , District.....
District Headquarters.....● GULU
Other Meteorological Stations.....● Budo
with average annual rainfall in inches 46.90

Compiled from information
supplied by the Meteorological
office at Entebbe - by

*F. C. MacDonald, Uganda Survey Dept.
July 1925.*



LIST OF CIRCULAR